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## A School of Mechanical Engineering.

THE STEVENS INSTITUTE OF TECHNOLOGY.

The importance of a system of technical education as an aid, if not as the greatest of all instruments, in the work of promoting civilization and the growth of national wealth and power, has long been recognized by every intelligent citizen of the United States as well as of the transatlantic nations. In the several states of Germany such a system has long been in successful operation, but singular as it may at first thought appear, hardly a beginning has been made in our own country until very recently, and, even now, although we possess a few technical schools, a *system* of technical education extending from our primary schools up to the university has nowhere, we believe, been adopted.

The peculiarly practical turn of the American intellect, its activity and its keenness of appreciation has rendered our people less dependent than any other upon such a system of training. No nation can, however, at the present time hold a leading position as a manufacturing country, nor even escape the penalties that follow defeat by commercial rivals, if it long neglects to avail itself of the advantages peculiar to the adoption of a general technical education of its people. And it is therefore with peculiar pleasure that we view the establishment of purely technical schools in our own country, where the student may acquire not only that mental training in habits of thought and of study that is always so desirable, but also that kind of knowledge which will be most useful to him in his professional career.

The most recently founded school of this character is the Stevens Institute of Technology, in our neighboring city of Hoboken.

This noble institution was founded by a bequest of the late EDWIN A. STEVENS, a son of Colonel John Stevens of Hoboken, one of the earliest and most distinguished of American engineers, who, as well as the sons, was especially well known in consequence of intelligent and fruitful labors in the application of steam power on both land and water.

The college is situated in the pleasantest portion of the city, its windows commanding a beautiful view of the surrounding country as well as of our harbor and bay, and the edifice itself presenting a fine appearance when viewed from the deck of the ferryboat as we cross the river to visit it. (Plate I.)

The building is very substantially built of blue trap rock, with brown-stone trimmings, from designs by Upjohn. It extends from street to street, and has two wings in the rear. It is three stories in height, and has a dry and roomy basement. Plate II.

In the basement is a workshop, occupying the whole of the right hand wing, and containing tools for working in both wood and metal, together with the steam engine which is to drive them.

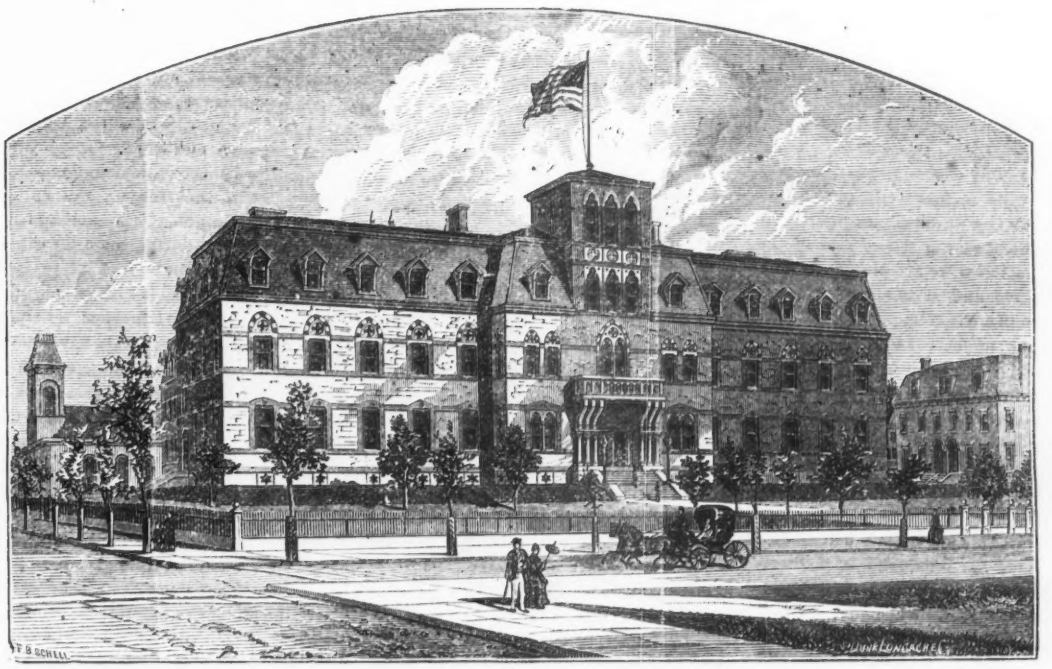
Here, also, are gas-holders for oxygen and hydrogen, and from them pipes are led to the several lecture-rooms, where the lecturers may have occasion to use the lime light or the oxyhydrogen blow-pipe.

At the opposite end of the basement are the boilers for heating the building, and for supplying steam to the engines, and at this end are the furnaces for metallurgical work, and under the wing are the assay room and the rooms of the janitor.

On the first floor (Plate III), we find at the right a splendidly lighted, high and airy hall, fitted up as a Physical Laboratory, and stocked with numerous ingenious and delicate forms of apparatus, such as were made use of by Faraday in his splendid researches in electricity, by Regnault and by Tyndal, and by Melloni in their investigations of the nature and laws of heat, and by other physicists in other almost equally classical labors.

In the large room at the rear of the main building, which is the public Lecture Hall of the Institute, we find seats for six hundred persons. The stage is fitted with all needed appurtenances. A trap door being raised pipes are discovered bringing water and gas from the street mains, oxygen and hydrogen from the tanks in the basement, and steam from the main boilers. Heavy copper wires connect with the large electric battery, and these, as well as the oxygen and hydrogen pipes are also led under the floor to the different points in the room (marked O H in the plate), where they may be reqired for the magic lantern, or for other purposes.

The large room at the extreme left, No. 3, in the main building is the library and Model Room. It is of the same size as the physical laboratory, and is also a beautifully proportioned and well-lighted room. Here are kept the books which form the germ of what is intended to be a fine technical library, and the models and apparatus which are not needed in the lecture rooms in illustration of the re-



*THE STEVENS INSTITUTE OF TECHNOLOGY.*

gular courses of instruction. This is also the Reading Room, and the tables are furnished with a well-selected list of periodicals, some of which are contributed by the publishers.

The room in the wing at the left is the Chemical Laboratory, which, although not lofty, is well ventilated and well fitted up with the best of modern apparatus. The Balance Room is immediately adjacent and contains some fine apparatus.

The second floor (Plate V.) is occupied by the several lecture rooms. At the right is the lecture-room used by the President when it becomes necessary for him to take part in instructing advanced classes, and at other times in special researches.

The little room off the stair landing is also used by the President, as a workroom.

The lecture-room of the Professor of Physics is next to the preceding—a pleasant, well-arranged room fitted up with every imaginable convenience, including all that were noticed in the larger lecture hall, and also a pneumatic trough, and a set of Bunsen air pumps.

Immediately over the main entrance is a room containing the principal part of the optical collection of the Institute, which is said to be the finest in the world and contains some exceedingly interesting pieces of apparatus. One of the largest instruments was made for M. Arago, the celebrated French philosopher.

On each side of this room is a pleasant apartment; the one at the right being the study of the Professor of Physics, and that at the left the study of the Professor of Mechanical Engineering.

The large room next the room just mentioned is the Lecture Room of the Professor of Mechanical Engineering. This room is probably thirty-five feet square, sixteen feet to the ceiling, and well lighted, and thoroughly provided with means of heating and ventilation.

A large model case nearly covers the further side of the room and contains a fine collection of apparatus acquired partly by purchase and partly by contribution from friends of the school and of the enterprise; among the latter we are pleased to find many of our best known and most enterprising as well as liberal manufacturers. The purchased apparatus is from the German makers of models at Darmstadt and Frankfort and the French makers at Paris. The Germans seem to make them most substantially, and the French by far the most elegantly, and as a natural consequence the latter are the most expensive. Some few pieces are from London, and others are American, while still others were made at the Institute.

Among the most noticeable are the German models of gearing, several French sectional models of steam-engines, one of them being on quite a large scale, well proportioned, and very neatly made; a set of apparatus of different kinds for measuring the velocity of flow of water, dynamometers, cranes and windlasses, pumps, water wheels, turbines, and steam engines of various kinds.

The most beautiful model in the collection is a copy of the English oscillating engine with feathering paddles as made by PENN & Co. We hope that some one will have enough of enterprise and public spirit to make the Institute the possessor of an equally perfect model of the American steamboat engine.

We find in this collection models of the engine described by Hero of Alexandria over two thousand years ago, a modern copy of the old devices of DE CAUS and SAVERY, models of the engines of NEWCOMEN and of WATT, and a little horizontal stationary engine of 1½ inch cylinder and 4½ inches stroke with a drop cut-off which is adjusted by a little fly-ball regulator. It is supplied with steam by a copper boiler fed by a separate steam pump. It was made, we understand, by the head of this department when himself a boy at school.

At one end are boiler models, and at the other, roof and bridge trusses and scattered through the case are many pieces that would be unusually interesting if they were not surrounded by so many others of still greater interest. A model of the Fontaine turbine by SALLERON of Paris is the most perfect specimen of model making imaginable, and hardly less beautifully made is a small Giffard Injector cut open to exhibit its internal construction. This was made and contributed by Sellers & Co. of Philadelphia. Blake & Bros. of New Haven contributed a powerful little stone crusher that will crumble between its jaws any mineral that can be inserted there. The Professor of Chemistry often finds this a convenient substitute for the mortar. Wm. D. Andrews & Bro. of this city, have given a neat little centrifugal pump; A. K. Rider a model of his steam engine; D. P. Davis and the Recording Steam Gauge Co. each have presented a finely finished specimen of the recording steam gauge. A. L. Holley furnished model rolls and specimen tuyeres as used in the Bessemer steel manufacture, and other manufacturers have exhibited equally active and helpful sympathy in this important enterprise by presenting other models and samples and have already placed in this department a valuable set of drawings which occupy a good proportion of the space allowed in the set of drawers, which extend along the side of the room opposite the model case.

Mr. Geo. B. Whiting, the well known and able Chief Draughtsman of the Bureau of Steam Engineering of the Navy Department, has placed here a large proportion of his own private collection of drawings, embracing some extremely valuable complete sets of drawings of steam machinery.

At the end of the room, at the right of the entrance, is a case which is beginning to fill up with samples of useful ores, minerals and metals. A set of specimens from the Penna Steel Co. illustrate the Bessemer steel manufacture by exhibiting samples of the steel rail and of all the material, ores, irons, spiegeleisen, ganister, etc., etc., that are used in its manufacture.

The Chrome Steel Co. contributed samples of their remarkable metal; the Pembroke irons and the iron of Catasauqua and elsewhere are shown with the ores from which they are made.

The Manhattan Oil Co. of this city, present samples of all commercial animal and vegetable oils, and the Dover Co. of mineral oils.

Prof. Thurston is gradually collecting a very interesting set of engineering relics.

In the Library and Museum on the first floor, we saw the identical high-pressure direct-acting engine and tubular boiler, and the remains of *the screw* used by John Stevens on the Hudson River in 1804, the little steamer attaining a speed of eight miles an hour at times. With these are the *twin screws* used by that great engineer in 1805.

In the lecture room we find the patent issued from the English Patent Office for this *tubular* boiler in 1805, to John Cox Stevens the oldest son of its inventor; and in the model case is a model of the same boiler, which exhibits a strong resemblance to some of the safety tubular boilers of the present day, and was evidently quite as efficient*

Here is to be seen a drawing of the engine of Fulton's first boat, the Clermont, drawn by Fulton's own hand, an autograph letter from Robert Fulton to Mr. Stevens, an autograph letter from Robert Stephenson, the distinguished son of the even more distinguished George Stephenson, which contains the assurance that *then*, 1835, the tendency in Great Britain was toward heavier rails and more powerful locomotives, and that the latest of his own design weighed *nine* tons and could draw one hundred tons at the rate of sixteen or eighteen miles an hour on a level. A sketch accompanies the description.

There are other things of interest to be seen here, but space will not allow of further description of this—to us—most interesting of the many interesting departments of the STEVENS INSTITUTE OF TECHNOLOGY.

We would like, had we space, to describe the collections of physical apparatus, the apartments with their apparatus and fittings belonging to the department of Chemistry to which is devoted all available space in the whole west wing, the pleasant drawing-rooms and recitation rooms and the work shops of Hawkins and Wales, the instrument makers to the Institute.

We would like to refer to the elegant researches of President MORTON in the investigation of fluorescence, of Dr. MAYER, in magnetism, of Prof. LEEDS, on the constitution of commercial wines and useful materials, of Prof. THURSTON, on the performance of steam engines and boilers, and other interesting work, almost constantly in progress, but must defer all this until another opportunity offers.

Instruction, during the first two years of the course, which is four years in length, is similar to that pursued in other colleges, except that the classics are not taught, all the available time being spent upon mathematics, English and foreign languages, and literature, and the usual courses in science, and this constitutes a course, preparatory to entering upon the technical and professional work of the last two years.

During the last two years, the student enters the laboratories and workrooms and pursues his professional studies with the intention of securing a practical and immediately useful knowledge of the several branches. In the physical laboratory, he makes for himself and with his own hands, the experiments that the student usually in our college courses merely witnesses from his seat at a distance from the lecture table, and when he has acquired some familiarity with the adjustments and uses of the apparatus, he enters upon a final course of independent research, the results of which, when new and valuable, are at once published.

In mechanical engineering, the course commences with the study of the nature of materials, used by the engineer, the methods adopted in obtaining them and preparing them for the market, and for use, and the best methods of preserving them from decay. The course is illustrated by specimens which, thanks to the great interest taken in the school, by all who have visited it, are continually coming in.

The course continues with the investigation of the facts and laws governing the strength of materials, by means of the apparatus of the Institute. In investigating tensile strengths, the use of the excellent and powerful testing machine of the Camden and Amboy Repair Shops, is generously allowed by Mr. Francis B. Stevens.

Instruction in the use of tools and in designing machinery follows, partly in this course, and partly in that of the Professor of Drawing, which is really almost as much a department of engineering, as that which is so-called. The course closes with the study from text book and lecture of the principal prime movers.

The departments of engineering and drawing work together from beginning to end, and the time given them is in the aggregate fully commensurate with their importance as leading departments.

Occasionally in response to the many invitations received, the students are given opportunity to do useful work outside the regular course, and to visit manufacturing establishments and places of interest.

During the past year, students of the Institute attended the competitive trial of steam boilers at the Fair of the American Institute, keeping the logs with commendable accuracy and exhibiting a professional interest in the work. They have engaged in at least one test of the performance of a newly designed steam engine, have visited among other places of interest, the Allen Engine Works, the Chrome Steel Works, the caissons of the East River Bridge, the machine department of the Brooklyn Navy Yard and the Iron Clad Dictator.

The cost of tuition is fixed at a minimum figure

* A sketch of this boiler is given in the Journal Franklin Institute for Sept. 1871, and in London Engineering, Jan. 5, 1872.

and, in special cases, is remitted entirely if the student, proving pecuniarily deficient, exhibits unusual attention to duties. The number admitted is, however, limited, and when the number of applicants capable of passing the preliminary examination exceeds this limit, the requisite number is obtained by selecting the most worthy.

Students who after studying two years exhibit special fondness for science are allowed to devote themselves to science during the remainder of the course, and are given, at graduation, the degree of Doctor of Philosophy, but the students are usually expected to take the course in engineering and to graduate as Mechanical Engineers, and students who have a special fondness for that branch are the class most desired.

Lectures on scientific subjects are delivered during the winter and spring in the great hall of the Institute.

During the present and past season, two lecture courses, the first a popular course and the second a technical course, have been given as announced in our columns, and a third—a popular course—is now in progress. The technical course, although not largely attended, was one of the finest of its kind ever delivered, and we are pleased to learn that it has been proposed to publish the lectures.

We annex the list of the Faculty as given in the last annual announcement of the Institute:

TRUSTEES.—MRS. E. A. STEVENS, Rev. S. B. DOD, WM. W. SHIPPEN, Esq.

FACULTY.—HENRY MORTON, Ph. D., President; ALFRED M. MAYER, Ph. D., Professor of Physics. ROBERT H. THURSTON, C. E., Professor of Mechanical Engineering; Lieut.-Col. H. A. HASCALL, Professor of Mathematics; C. W. MCCORD, A. M., Professor of Mechanical Drawing; ALBERT R. LEEDS, A. M., Professor of Chemistry; C. F. KROH, A. M., Professor of Languages; Rev. EDWARD WALL, A. M., Professor of Belles-Lettres.

## Polytechnic Association of the American Institute.

Meeting held April 5th, 1872, President TILLMAN in the chair.

THE PRESIDENT read a paper on the transmission of heat, which will be found elsewhere, and which led to the following discussion:

Prof. VAN DER WEYDE—I see one advantage in the proposed plan which has not been mentioned. Those who have experimented with the boiling of fluids, know that there is sometimes an explosive boiling. It generally occurs when the vessel in which the liquid is boiled is very smooth. Sometimes sand is put in to prevent this. A steam boiler which is smooth inside, or the tubes of which are smooth, is more in danger of explosive boiling than it would be if it were rough or had many projecting points. It is much better to have steam developed in small bubbles than in large bubbles. I think that this plan will tend to prevent explosive boiling, and priming, in steam boilers.

Mr. J. K. FISHER—As you have invited criticism, I will freely suggest the doubts that arise in my mind as to the advantages of the proposed plan. In the illustrated catalogue of Morris, Tasker & Co., of their tubes, instructions are given, if the water is to be outside of the tubes, to reckon the outside surface of the tubes, and if the water is to be on the inside, to reckon the inside surface. That indicates their opinion that the surface exposed to the water parts with its heat more readily. When the tube is to be used in a heater, with steam on one side and gas on the other, they direct taking the mean of the two surfaces. That seems to me to conflict with your view that it is necessary to extend the surface exposed to water. In the case of the Perkins Steam Boiler, made in London 25 or 30 years ago, which consisted of a series of tubes, with water circulating through them, and passing under the fire, PERKINS allowed 2·6 feet of heating surface in the fire, to 1·6 feet in the water. His experiments led him to adopt that as the best proportion. That also indicated that it requires less surface in the water than in the fire of gases. I should not regard these projections, then, as heating surface. According to these authorities, the surface exposed to the water is already superabundant. They had formerly in London a form of pipe in which there were pins sticking into the smoke, to take up the heat. That was abandoned; partly from cost, and partly from the difficulty of cleaning. Any addition to the surface costs something; and the question is whether this is the most economical mode. It seems to me likely that the same amount of additional surface, put in the form of a greater number of tubes, would answer as well.

Prof. VAN DER WEYDE—I should not consider the difference between measuring on the inside or outside of a pipe as amounting to much on a question of this kind; even when the tubes are small and the thickness considerable. The question is whether the tubes ever get too hot. If they do, they take up heat faster than they can radiate it. I say that as a matter of fact they do get too hot. Then this prevents it. You cannot get one of these tubes red hot, while it is surrounded with water. And you cannot prevent the tubes from getting too hot, in this mode, without putting the heat exactly where it is wanted—in the water.

The PRESIDENT—Suppose the temperature of the fire to be 1,000°. The amount of heat the pipe will take up, is in proportion to the difference of temperature between the pipe and the gases of the fire. If the pipe is heated up to 500°, it will take from the fire far less heat than if it is kept nearly as cool as the water. We must remember that water is not a conductor of heat; that we heat it by convection. Iron is a very many times better conductor of heat than water. These projections come in contact with the largest possible amount of water, and in a manner to secure the most rapid convection of the heat. The pipe is thus kept at the lowest possible temperature, and in a condition to take up the largest possible amount of heat from the gases.

Mr. FISHER—Your reasoning is very good, from the premises; but I consider the premises unduly assumed. You assume that the pipe gets hot. I know that when they get foul, from incrustations. for instance, they frequently do get hot. Sometimes they get too hot because the water has not free access to the pipes. In the case of a locomotive boiler that burst at Providence, the tubes had originally been ⅜ of an inch apart. In rebuilding it, they left out some of the tubes, and put the rest ¾ of an inch apart. The result was that it made steam as well as it did before. I have never found evidence that in a well-proportioned and clean boiler, where the water had free access to the tubes, the tubes got sensibly hotter than the water. This is a question which can easily be settled by experiment; by putting on rings of metal of different degrees of fusibility, ascertained beforehand by testing the same metal.

The PRESIDENT—The matter will be tested thoroughly.

Mr. PARTRIDGE—How will the tubes be kept from incrustation, or how would they be cleaned?

The PRESIDENT—There would be no incrustation, because the water would always pass so rapidly through these spaces.

Mr. PARTRIDGE—There is a very successful heater, upon this principle—that is, having a series of cast iron disks upon the tube; but they are at right angles with it.

The PRESIDENT—That is for increasing the radiation, which is not exactly the point that I make.

Dr. RICHARDS—The stove of Dr. NOTT was upon the same principle. He taught his classes that the rougher the stoves, the more heat they gave; and this radiation of the heat in the water is upon the same principle. Points of metal running into these pipes would increase the effect; but it would be difficult to clean them. There may be an obstacle in the use of these plates, that there may be an incrustation.

The PRESIDENT—Mr. FISHER has referred to the fact that where there are too many vertical tubes, the central tubes may be overheated because the water cannot get to them. It is evident that no such result can occur upon the plan that I propose. Dr. NOTT's stove has been referred to. He was the first man that burned hard coal, and his idea was this: to have a generator of heat in one place, and a radiator of heat in another. He had a generator lined with fire-brick, in which the coal was burned; and above that was a sheet-iron radiator. But his greatest invention was passing the draft across the bottom of the fire; the principle of the modern "base-burning" stoves, and the only economical way to burn coal.

Mr. FISHER—If you were to hang a plate inside of the pipe, it would absorb heat from the smoke and radiate it against the tubes, and thus increase the effect. Or if you were to make it a partition, it would be still better. I believe that increasing the receiving surface will have more effect that increasing the surface exposed to the water.

Mr. OSBORNE—I think that in the distillation of petroleum we have an indication that the pipes do get too hot. If we take kerosene, volatilizing at from 110° to 150°, and distil it in the ordinary way, we get coke; and that coke must come from destructive distillation, which cannot take place below 600°.

With regard to your remark that the heat taken up by a pipe will be in proportion to the difference of temperature, I think it is in a geometrical ratio and not a mere proportion; so that I think there will be a greater difference in favor of the extended surface than you calculated.

With regard to the deposit and incrustation I believe that always occurs where there is an eddy formed, or where there is a sudden access of heat; so that the deposit would be at the bottom of the boiler, and these spaces would be kept clear.

Prof. VAN DER WEYDE—When the projections are on the inside of the pipe, they take up heat from the smoke, and the pipe is hotter than it would be without them; but it cannot give the heat readily to the water. One quarter of an inch of water will totally obstruct the radiation of heat. The plates projecting into the water, on the other hand, enable the water to take up the heat from the pipe. In illustration of the impossibility of radiating heat through water, we may take a differential thermometer so sensitive as to be moved by the approach of the hand, and cover the bulb with a thin layer of water, then pour on ether and set it on fire, and the thermometer will not start by a hair's breadth. Or we may freeze water in the lower part of a tube, and holding it obliquely over a flame, boil water in the upper part of the tube for a quarter of an hour without melting the ice.

Mr. SLANGSBY—I think there can be no doubt that more heat will be taken from the fire by this means than with a tube in an ordinary form. The only difficulty I see is in the construction of the boiler. I do not see how the tubes can be removed.

The PRESIDENT—That is a difficulty, but it has been overcome. They are screwed in at one end, and the other is put on with a thimble.

Dr. BRADLEY—I always, when I can, act as mediator between contending parties. I propose to bring these two theories together, and to take the heat from the fire by projectors within the tubes, and to impart it to the water by projections on the outside of the tubes. I think that would be better than either alone; but I apprehend there would be difficulty in casting the pipes.

### MANNA.

Dr. J. V. C. SMITH read a paper on the Manna described as gathered by the Israelites in the wilderness, maintaining that it was entirely different from

any known substance, and was miraculously furnished to them.

Dr. RICHARDS said that the Jewish manna seemed to have been an animal product resembling what is called Honey-dew, the exuviae of small animals found under certain trees, mostly beech trees, at certain seasons; but that there is now nothing known anywhere corresponding to the description of manna.

Dr. SMITH expressed the belief that the very pot of manna put up to be kept for generations, would yet be discovered.

SUSPENDED RAILWAY.

A model of a street railway, suspended from the houses, and not interfering with the street below, and especially adapted to narrow streets closely built up with brick buildings, was exhibited by JULIUS H. STRIEDINGER.

ON THE DETERMINATION OF THE INVISIBLE AQUEOUS VAPOR IN THE INACCESSIBLE UPPER STRATA OF THE ATMOSPHERE.

Prof. VAN DER WEYDE—Early in this century LESLIE measured the clearness of the sky by the radiation from the bulb of a differential thermometer placed in the focus of a horizontal parabolic reflector. The mirror being a polished surface radiated no heat, but merely reflected that radiated by the bulb. If the sky was clear, the heat would be radiated, and there would be no return, and the thermometer would fall; but if there were clouds, the thermometer would remain stationary. LESLIE states that sometimes when the sky is clear, the thermometor will fall 50 degrees; and at other times, when it is apparently just as clear, it would not fall at all; and at that time this anomaly was unexplained. Experiments have recently been made by TYNDALL on the radiation of heat through different vapors. All gases and vapors absorb heat; but common air, nitrogen, hydrogen, and oxygen, absorb the least. He found, for instance, that the vapor of patchouli, absorbs fifty times as much heat as common air; and that other vapors absorb still more. And he found that the vapor of water is the great cause of absorption of heat by the air. A moist atmosphere acts like a valve, admitting to the earth the intense solar rays of heat, and preventing their radiation, It is found, therefore, that the amount of cooling of the differential thermometer indicates the amount of invisible moisture in the atmosphere. When clouds are formed, radiation is entirely stopped.

Dr. BRADLEY—It may be added that the moist atmosphere not only absorbs the heat that is radiated, but radiates it back again to the earth.

Adjourned.

## On the Transmission of Heat.

BY SAMUEL TILLMAN, L.L. D.

The uses to which heat is applied in the arts are so numerous and important that plans for its more economical generation and transmission are always examined with interest, more especially since Science has demonstrated that with the best contrivances yet employed but a small portion of the actual heat product of combustion has been converted into available power. Our subject will be best illustrated by treating it under different heads.

1. *Of Boilers.*—Heat as a motor is unrivalled, because with proper fuel it may be generated at any time and in any place. The two best mediums for its use are the cheapest and most universally distributed, namely water and air. Of the two, water has the greatest specific heat, yet it is by far the most convenient, since just in proportion to the quantity of water evaporated in a closed vessel the pressure of steam will be increased; therefore the boiler has become the most generally used generator and receptacle of force. It consists of two parts having entirely distinct functions, namely, the fire-box or furnace, and the metallic shell containing the water and steam. That portion of the shell, and the tubes connected therewith, which separates the water from the burning fuel, and the gaseous products of combustion acts at the same time as the sole medium through which the heat is transferred from the fuel to the water.

The application of heat to one side of a metallic plate, and its absorption in sufficient quantity by the water on the other side results in the generation of steam. The displacement of water from the heating surface in the state of vapor, and its replacement is the ever-repeated action in the process of boiling. It is apparent that the steam cannot pass away from the heated plate without carrying with it a portion of the water, which should be followed by an equal amount of cooler water, thus forming a current. When this movement does not take place the whole mass of water is sometimes lifted above the heating surface, and is doubtless often the incipient cause of disaster. In vertical tubes, through which the smoke and gases resulting from combustion pass off, the contact of water is impeded by the constantly ascending vapor and this contest of particles is so great that only the lower portion of each tube is fully effective. To remedy this evil I propose to fasten on each tube a series of metallic disks or plates, in close proximity to each other, and in an inclined position. When a cast iron tube is used these disks are cast on the tube. In a cylindrical boiler, standing on its end, with a fire-box beneath, the vertical tubes, through which the products of combustion escape, are arranged in a circle a few inches from the shell, which in this case is not exposed to fire. The disks surrounding the tubes are inclined so as to be lowest on the side nearest the shell; they project from one to two inches beyond each tube, and the disks of adjoining tubes are in close proximity, so that the fluid between the disks cannot pass vertically upward, and can only escape by following the direction of the disks, and rising in the inner portion of the boiler. The object of this arrangement of disks is to more rapidly lower the temperature of the tube by quickly transmitting the heat into the disks so as to extend it over a much larger area of surface in contact with the water; thus preventing that over-heated condition of the tube which repels water and throws it into the spheroidal state. Experience proves that a given area of metal at a given high temperature will not produce ebullition as rapidly as double that area having a temperature only half as high, measured from that of the surrounding water.

Another object of still greater moment is effected by means of the disks, namely, every particle of steam formed within the disks is immediately conveyed away from the tubes and entirely beyond the limits of the disks; to which it cannot return to interfere with the further process of boiling. Both water and steam will be carried inward and upward; the steam will remain in the highest portion of the boiler, while the water will gradually descend along the inner surface of the shell, and on its passage downward will supply every disk with the required quantity of water, thus producing constant and complete circulation of water in every part of the boiler. As the steam generated between every pair of discs is immediately discharged upward, thus providing room for the incoming water, it is apparent that every portion of each tube, from its bottom to the water line is rendered effective; and as metal is a vastly better conductor of heat than water, increased facilities are provided for arresting the heat contained in the ascending gaseous products of combustion, and transferring it to the surrounding water; thus less heat will escape up the chimney unutilized than in the case where the tubes used have no covering of discs. Arrangements are being made for ascertaining by experiment the exact amount of water evaporated with a given amount of fuel in two boilers of the same size; one containing plain tubes and the other tubes covered with discs, with the intention of laying the result of such comparative test before this Association at a future meeting.

2. *Of Steam Heaters.*—Tubes or pipes covered with discs, as already described, may be used in heating air for warming purposes by means of steam. As the discs or plates are virtually a series of strengthening bands, the pipe surrounded by them may be made of very thin metal which will permit the heat to pass more rapidly outward. A very compact and effective apparatus may be constructed by arranging a series of vertical pipes, after they have been covered with thin plates or discs, so as to be connected at each end with a hollow metallic ring. The steam is admitted into the upper hollow ring and, after passing through each of the vertical pipes simultaneously, is discharged, either as steam or water, through the lower hollow ring into an exit pipe. The thin plates or discs surrounding the vertical pipes are inclined so as to be lowest on the outside of the apparatus. As the air, drawn in on all sides, is heated in its passage between each pair of discs, it moves inward and upward; and after escaping through the upper ring continues to rise until it reaches the ceiling of the room, and passing along its whole area displaces the colder air, which sinks and is soon carried through the heating apparatus, thus ensuring by perfect convection a uniform temperature. A novel feature in this arrangement is the method of preventing the air which just passed between the heating discs from being immediately exposed to other heating surfaces before it escapes from the apparatus. When this steam heater is placed in the basement of a building the cold air may be admitted through the upper ring, and be discharged outward on all sides, in which case the discs are inclined so as to be lowest on the inside of the pipes.

¶ 3. *Of Condensers.*—Air being about 800 times lighter than water at the mean temperature of the atmosphere it is evident that it cannot be substituted for the condensing water used in ordinary low pressure engines, but in engines of very small size varying from one man to a one-horse power it is feasible to add a series of apparatus, similar to that described for heating by steam, in which the quantity of inflowing cool air will be sufficient to condense the exhaust steam from such an engine. The air which thus absorbs the heat of the steam would be conducted into a chimney, the draft of which would be sufficient to provide a full supply of cold air. It is evident that in winter the air thus heated could be utilized with such an apparatus, and the water condensed could be pumped directly into the boiler.

4. *Of Stoves.*—The steam-heating apparatus described may be modified so as to be applicable to stoves; all that would be required is the substitution of the upper plate of a stove for the lower hollow ring. The heat generated and contained in the products of combustion would pass through a series of pipes enclosed with discs, and such gaseous products after loosing most of their heat, be discharged from a hollow ring above. In this case the whole apparatus could be constructed of cast iron.

In the several structures described, the same general features are found; the novelty of which consists in furnishing very great area of heating surface, at the same time securing to the fluid to be heated a rapid ingress and egress.

THE DELAWARE RIVER, below Philadelphia, is referred to as the future Clyde of America. There are now in process of construction, at various points, sixteen iron steamers, seven of which range from 2,500 to 3,000 tons each. It is noticeable that, while nearly all the shipyards in this country devoted to building wooden ships are idle, the yards for building iron vessels at Philadelphia and vicinity are all full of work. Four of the largest iron steamships in process of erection upon the "American Clyde" are being built for the Pennsylvania Railroad Company, thus pushing its communication across the ocean. It is also stated that the iron vessels turned out on the Delaware are equal in every respect to those built on the Clyde, and that, when completed, they consume much less coal per day than English vessels of the same class.

## THE COAL TRADE.

### Anthracite Coals.

NEW YORK, April 12, 1972.

WHOLESALE.—The condition of the coal market during the past week has been quiet, and yet considerable coal has been shipped. The receipts have been correspondingly heavy, however, and the amount of coal on hand has not been materially reduced. Manufacturers and other users of steam power have for some time past been laying in supplies of coal for spring and summer use, but it cannot be expected that they will lay in their winter supplies for some time to come.

It would now seem that the Belvidere and Delaware road has an understanding with the Delaware, Lackawanna and Western and the New Jersey Central roads regarding the tolls to be charged on coal, though of course nothing can be said authoritatively on the subject just now. Prices remain unchanged.

FREIGHTS.—Freights rule somewhat lower than last week.

### Anthracite Coal Trade for 1871 and 1872.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending Mpril 6, 1872, compared with the week ending April 8, 1871.

| COMPANIES. | 1871. WEEK. | 1871. TOTAL. | 1872. WEEK. | 1872. TOTAL. |
|---|---|---|---|---|
| *Phila & Reading R.R† | 35.911 | 772,544 | 122.828 | 1,154,987 |
| Schuylkill Canal | 4 059 | 43,574 | 21,835 | 38,009 |
| *Lehigh Valley R. R. | 10,638 | 406,072 | 69,956 | 957,990 |
| Lehigh & Sus. R. R. | 12.413 | 89,735 | 38,413 | 375,824 |
| Lehigh Canal | .... | ..... | ... | ..... |
| Scranton North | .... | 3,523 | 10,042 | 162,210 |
| " South | .... | 137 | 46,536 | 530,742 |
| Penn. Coal Co., rail | 89 | 3,535 | 25 194 | 255,919 |
| " " " canal | .... | ..... | .... | ..... |
| Del. & Hud. Canal Co. | ..... | ..... | ... | ..... |
| " East | 1,451 | 51,511 | 15,199 | 161,616 |
| " " West | .... | 12,720 | 7,639 | 103,119 |
| " " South | .... | ..... | 7,539 | 88.900 |
| Shamokin | 13,133 | 125,957 | 12,227 | 198,800 |
| Trevorton | .... | ..... | .... | .... |
| Lykens Valley Coal Co. | 2,045 | 14,634 | ... | 2,580 |
| Wyoming South | .... | ..... | .... | .... |
| Wyoming North | .... | ..... | .... | .... |
| P. N. Y. C. & R. R. Co. | 123 | 34.941 | 12,723 | 176,770 |
| Williamstown Col'y | .... | 17.847 | .... | .... |
| Big Lick Col | 2,889 | 22,845 | .... | 10,591 |
| Total | 82,796 | 1,599 572 | 390,131 | 4,128,057 |
| 1870 | .... | .... | 82,796 | 1,599,572 |
| Decrease | | | | |
| Increase | | | 307,335 | 2,528,485 |

* These figures are for the week and fiscal period commencing Nov. 30.

† Less coal transported for Co's use and Bituminous coal.

### Bituminous Coal Trade, 1871 and 1872.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending April 6, 1872, compared with week ending April 8, 1871.

| COMPANIES. | 1871. Week. | 1871. Year. | 1872. Week. | 1872. Year. |
|---|---|---|---|---|
| C. & O. Canal | 18,394 | 68,257 | 19,323 | 44 823 |
| B. & O. R. R. | 31 446 | 251,695 | 24,972 | 270,843 |
| H. & B. T. R. R. | 8,433 | 82,138 | 8,134 | 83,490 |
| *Harrisburg & D | 14,680 | 131,945 | 10,340 | 167,360 |
| *L. V. R. R. | .... | 12,734 | 496 | 10,289 |
| P. & N.Y.C. & R. Co. | 4,385 | 75,974 | 7,322 | 102,975 |
| Cumberl'd Branch Canal | 5,675 | 21,971 | 5,478 | 13,878 |
| " " Railroad | 1,594 | 19,940 | 485 | 776 |
| Total | 84,607 | 664,654 | 76,550 | 694,434 |
| | 76,550 | | | 664.654 |
| Decrease | 8,057 | | | |
| Increase | | | | 29,780 |

### Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending Bprll 6, 1872, with totals to date, compared with same time last year.

| WHERE SHIPPED FROM. | WEEK. Tons. Cwt. | TOTAL Tons. Cwt. |
|---|---|---|
| Total Wyoming | 9,093 02 | 168,943 16 |
| " Hazleton | 45,578 14 | 632,7.0 13 |
| " Upper Lehigh | 78 19 | 1,062 17 |
| " Beaver Meadow | 16,374 13 | 225,732 00 |
| " Mahanoy | 8,851 18 | 77,277 17 |
| " Mauch Chunk | 53 19 | 1,303 17 |
| Total | 80,031 05 | 1,108,021 00 |
| Same time last year | 11.2:9 16 | 431,659 19 |
| Increase | 68,771 09 | 646,361 01 |
| Decrease | | |
| Forwarded East from Mauch Chunk by rail | 69,955 11 | 957,990 03 |
| Same time last year | 10,637 13 | 406,071 16 |
| Increase | 59,317 18 | 551,918 07 |
| Decrease | | |

DISTRIBUTED AS FOLLOWS.

| | | |
|---|---|---|
| Forwarded East from Mauch Chunk by rail | 68,915 01 | 939,504 17 |
| do East for use L. V. R. R. | 1,040 10 | 18,485 06 |
| Delivered at and above Mauch Chunk for use of L. V. R.R. | 982 08 | 20,526 15 |
| To P. & N. Y. R. R. | 7,265 07 | 100,452 16 |
| To N. C. R. R., at Mount Carmel | | 73 06 |
| To D. H. & W. R. R. | 863 01 | 7,861 01 |
| To L. & S. R. R. at Packerton for rail | 286 19 | 5,474 12 |
| Delivered at M'h Chunk | 36 06 | 770 12 |
| Delivered on line of road above Mauch Chunk | 478 09 | 8,114 02 |
| To L. & S. R. R., at Penn Hav., for railroad | | 3,950 07 |
| Do. for canal | | 864 07 |
| To Lehigh Canal Mauch Chunk | | 99 07 |
| To Catawisa Railroad | 162 19 | 1,843 12 |
| Total | 80,031 05 | 1,108,021 00 |

### Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, April 6, 1872.

BY RAILROAD.—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.

| | Tons. Cwt. |
|---|---|
| From St. Clair | 39 381 15 |
| " Port Carbon | 6,677 19 |
| " Pottsville | 2,182 10 |
| " Schuylkill Haven | 20,627 11 |
| " Pine Grove | 5,162 14 |
| " Tamaqua | 11,184 11 |
| " Harrisburg | |
| " Dauphin | 4,458 11 |
| Total | 89,675 11 |

FOR SHIPMENT BY CANAL.

| | |
|---|---|
| Passing Frackville Scales | 4,486 14 |
| " Mill Creek " | 3,573 13 |
| " Schuylkill Valley Scales | 1,152 02 |
| " Mt. Carbon " | 982 11 |
| " Cressona " | 9,195 13 |
| " Pine Grove " | |
| " Tamaqua " | 903 15 |
| Total | 19,694 08 |

SHIPPED WESTWARD VIA NORTHERN CENTRAL RAILROAD.

| | |
|---|---|
| Passing Locust Gap | 1,141 06 |
| " Shamokin | 4,349 11 |
| " Herndon | ..... |
| Total | 5,490 17 |

SHIPPED WEST OR SOUTH FROM PINE GROVE.

| | |
|---|---|
| Via Schuylkill & Susquehanna R. R. | 1,651 15 |
| " Lebanon & Pine Grove Branch | 769 13 |
| Total | 2,421 08 |

CONSUMED ON LATERALS.

| | |
|---|---|
| From Frackville Scales | 754 01 |
| " Mill Creek " | 553 09 |
| " Schuylkill Valley Scales | 957 01 |
| " Mt. Carbon " | 951 06 |
| " Cressona " | 363 08 |
| " Pine Grove " | 269 07 |
| " Tamaqua " | 386 06 |
| Total | 4,234 18 |

LEHIGH AND WYOMING COAL.

| | |
|---|---|
| Received via Allentown, E. Penn'a Br. | 218 10 |
| " " Alburtis, " " | ..... |
| " " Oreland, G. & N. Br. | 828 19 |
| " " Connecting R. R. | ..... |
| " " Willow Street R. R. | 263 14 |
| Tota | 1,311 03 |

BITUMINOUS.

| | |
|---|---|
| From Harrisburg | 10,340 01 |
| " Connecting R. R., G. & N. Br. | |
| " Junction R. R. | |
| Total | 10,340 01 |

COAL FOR COMPANY'S USE.

| | |
|---|---|
| Anthracite | 5,428 03 |
| Bituminous | 244 14 |
| Total | 5,672 17 |

RECAPITULATION.

| | Total for Week. | Corres-p'g week last year. | Increase and Decrease. |
|---|---|---|---|
| Passing over Main Line and Leb. Val Branch | 89,675 11 | 18,894 00 | i 70,781 11 |
| For Shipment by Canal | 19,694 08 | 5,254 05 | i 14,440 03 |
| Shipped Westward via Northern Central R. R. | 5,490 17 | 9,530 16 | d 4,039 19 |
| Shipped West or South from Pine Grove | 2,421 08 | 903 00 | i 1,518 08 |
| Consumed on Laterals | 4,231 18 | 1,323 17 | i 2,911 01 |
| Lehigh and Wyoming Coal | 1,311 03 | 4 19 | i 1,306 04 |
| Total Anthracite paying freig't | 122,828 05 | 35,910 17 | i 86,917 08 |
| Bituminous | 10,340 01 | 14,679 17 | d 4,339 16 |
| Total of all kinds paying freig't | 134,168 06 | 50,590 14 | i 82,577 12 |
| Coal for Company's use | 5,672 17 | 5,237 04 | d 436 13 |
| Total Tonnage for Week | 138,841 03 | 55,827 18 | i 83,013 05 |
| Previously this year | 125813607 | 918,323 15 | i 339,812 12 |
| Total to date | 139697710 | 974,151 13 | i 423,825 17 |

SHIPPED BY CANAL.

| | | | |
|---|---|---|---|
| From Schuylkill Haven | 20,818 13 | 1,213 00 | i 19,605 13 |
| " Port Clinton | 1,089 00 | 4,262 00 | d 3,173 00 |
| Total Tonnage per Week | 21.907 13 | 5,475 00 | i 16,432 13 |
| Previously this year | 16,101 16 | 40,035 17 | d 23,934 01 |
| Total to date | 38,009 09 | 45,510 17 | d 7,501 08 |

### Lehigh Coal and Navigation Company,

Report of Coal transported over the Lehigh Canal and L. & S., Div. of Central Railroad of New Jersey for the week ending April 6, 1872, and for the year 1872.

| | WEEK. | YEAR. |
|---|---|---|
| Forwarded East of Mauch Chunk by Rail | 38,412 | 375,823 |
| Delivered at and above do., | 1,402 | 17,264 |
| Forwarded East of do., by Canal | .... | |
| | 39,814 | 393,087 |
| Corresponding period last year— | | |
| Forwarded East of Mauch Chunk by Rail | 12,458 | 89,734 |
| Delivered at and above do., | 1,964 | 12,596 |
| Forwarded East of do., by Canal | .... | |
| | 14.423 | 102.330 |
| Increase on Railroad | 25,391 | 209,757 |
| Decrease " " | | |
| Increase on Canal | | |
| Decrease " " | | |
| Of the above there was transported on account of— | | |
| Lehigh Coal Nav. Co | 15,156 | 108,541 |
| Wilkesbarre Coal & Iron Co | 17,424 | 206,740 |
| | 32,581 | 315,281 |
| Corresponding period last year— | | |
| Lehigh Coal Nav. Co | 576 | 20,334 |
| Wilkesbarre Coal & Iron Co | 12,226 | 60,483 |
| | 12 803 | 80,817 |
| Increase | 19,778 | 234,446 |
| Decrease | | |

### Report of Coal Transported over Central R.R. of N. J. (Lehigh and Susq. Div.)

Week ending Bapril 6—Compared with same time last year.

| WHERE SHIPPED FROM | WEEK 1872., tons ct | WEEK 1871. tons ct. | YEAR 1872 tons cwt. | YEAR 1871. tons.cwt. |
|---|---|---|---|---|
| Wyoming Region | 24831 16 | 13889 18 | 28119 16 | 78849 00 |
| Upper Lehigh Region | 3360 02 | | 49627 08 | 4614 06 |
| Beaver Meadow Region | | | | |
| Hazleton Region | 236 04 | 85 01 | 4416 08 | 1120 17 |
| Mahanoy Region | | | | |
| Treskow Region | 3731 13 | | 15836 14 | 1043 03 |
| Mauch Chunk Region | 12616 05 | 576 04 | 99518 00 | 19098 04 |
| Totals | 44776 00 | 14551 03 | 450585 05 | 104725 10 |
| Increase | 30224 17 | | 345859 15 | |
| Decrease | | | | |
| DISTRIBUTION. | | | | |
| Forwarded East of Mch Chunk by Rail | 38412 15 | 12158 06 | 375823 13 | 89734 14 |
| Forwarded East of Mch Chunk by Canal | | | 105 12 | |
| Delivered at and above Mauch Chunk | 1402 02 | 1964 15 | 17264 03 | 12576 02 |
| L. V. R. R at Packer'n | 196 06 | 124 02 | 4338 17 | 2294 14 |
| Delivered to L. & B. R. R.at Plymouth Bridge | 4764 17 | | 53053 00 | |
| Totals | | | | |
| Of the above there was transported on acc'nt of L. C. & N. Co | 15156 12 | 576 04 | 108541 14 | 20334 11 |
| W.-B. C. & I. Co | 17424 18 | 12.26 16 | 206740 00 | 60483 01 |
| Totals | 32581 10 | 12803 00 | 315281 14 | 80817 12 |
| Increase | 19778 10 | | 234464 02 | |
| Decrease | | | | |

### Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending Bpril 6, 1872.

| | 1872. WEEK. | 1872. YEAR. | 1871. WEEK. | 1871. YEAR. |
|---|---|---|---|---|
| By Railway | 25,193 19 | 255,918 17 | 89 14 | 3,535 04 |
| " Canal | ..... | ..... | | |
| Total | 25,193 19 | 253,918 17 | 89 14 | 3,535 04 |
| Increase 1872 | 252,383 13 | | | |

### Huntington and Broad Top R. R. Co.

| | |
|---|---|
| For week ending March 30, 1872 | 8,102 tons. |
| Same time last year | 8,426 " |
| Increase | |
| Decrease | 324 " |
| Total amount shipped to date | 75,356 " |
| Same time last year | 73,705 " |
| Increase | 1,651 " |
| Decrease | |

### Penn. and N. Y. R. R.—Coxton, Pa.

Coal tonnage for week ending April 6, 1872.

| | Week. Tons. Cwt. | Total. Tons. Cwt. |
|---|---|---|
| Anthracite received: | | |
| From Lehigh Valley R. R. | 7265 07 | 100,452 19 |
| " Lack. & B. R.R. | 1923 08 | 25,052 19 |
| " Pleasant Valley R. R. | 2171 13 | 32,181 00 |
| " Sul. & Erie R. R. | 1363 09 | 19,083 10 |
| Total | 12,722 17 | 176,770 05 |
| Distributed: | | |
| To Lehigh Valley R. R. | | 18,354 18 |
| To Lack. & B. R. R. | 239 03 | 1.017 17 |
| To S. Central R. R | 2844 15 | 31 396 14 |
| To Ithaca & A. R. R. | 4094 15 | 42.226 11 |
| To Erie R. W. Pockets for shipm't. | 3674 12 | 47,526 00 |
| To individuals on line of road | 484 17 | 10,973 16 |
| To points at & above Carbon for use of Co | 681 07 | 8,957 02 |
| To points between Waverley and Elmira | 7 3 08 | 16,317 07 |
| Total | 12,724 17 | 176,770 05 |
| Bituminous: | | |
| Received from Barclay R. R. | | |
| Shipped North from Towanda | 7253 01 | 102 028 08 |
| Shipped South from Towanda | 68 13 | 855 12 |
| Northern Central R. R. | | 91 01 |
| Total | 7321 14 | 102,975 01 |
| Distributed: | | |
| To Erie R. R. | 6636 17 | 90,391 18 |
| To So. Central R. R. | 616 04 | 11,484 15 |
| To Ithaca & A. R. R. | ..... | 21 15 |
| To Lehigh Valley R. R. | 6 14 | 735 02 |
| To individuals on line of R R | ..... | 253 11 |
| To points on line of road for use of Company | 61 19 | 88 00 |
| Total | 7321 14 | 102,975 01 |

### Schuylkill Canal.

Report of coal transported over the Schuylkill Canal for the week ending Saturday, April 6, 1872.

| | Tons. Cwt. |
|---|---|
| From Schuylkill Haven | 20,746 05 |
| " Port Clinton | 1,089 00 |
| Total for week | 21,835 05 |
| Previously this year | 16,174 04 |
| Total | 38,009 09 |
| To same time last year | 43,573 17 |

### Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna and Western R. R., for week ending April 6, 1872:

| | Week. Tons. Cwt. | Year. Tons. Cwt. |
|---|---|---|
| Shipped North | 10,042 05 | 162.210 09 |
| Shipped South | 46,536 05 | 530,741 18 |
| Total | 56,578 10 | 692,952 07 |
| For the corresponding time last year: | | |
| Shipped North | | |
| Shipped South | | |
| Total | 7,759 03 | 13.019 05 |
| Increase | 48,819 0 | 679 933 02 |
| Decrease | ..... | ..... |

### Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, April 6, 1872.

| | WEEK. | SEASON. |
|---|---|---|
| North | 47,264 04 | 638,238 03 |
| South | 7,359 18 | 88,900 09 |
| Total 1872 | 54,624 02 | 727,138 12 |
| Corresponding time in 1871: | | |
| North | Suspension. | |
| South | " | |
| Total | | |
| Increase North | | |
| Decrease North | | |
| Increase South | | |
| Decrease South | | |
| Total decrease 1872 | | |
| Total increase 1872 | 54,624 02 | 727,138 12 |

### Delaware and Hudson Canal Company.

The following is a statement of Coal Transported by the Delaware and Hudson Canal Co. for the week ending April 6, 1872.

| | FOR THE WEEK. | FOR THE SEASON. |
|---|---|---|
| By Delaware and Hudson Canal, | | |
| By Railroad, East | 15,199 | 161,616 |
| " " West | 7,639 | 103,119 |
| " " South | 7,539 | 88,900 |
| Total Tons | 30,377 | 353,635 |

For the same period last year.

| | FOR THE WEEK | FOR THE SEASON. |
|---|---|---|
| By Delaware and Hudson Canal, | | |
| By Railroad, East | 1,451 | 51,511 |
| " " West | | 12,740 |
| " " South | | |
| Total Tons | 1 451 | 64,231 |
| Increase | | 289,404 |

### Shamokin Coal Trade.

| | |
|---|---|
| For week ending April 6, 1872 | 12,227 08 |
| Same time last year | 13,132 16 |
| Increase | |
| Decrease | 905 08 |
| Total amount shipped to date | 108,799 18 |
| Same time last year | 125,957 08 |
| Increase | |
| Decrease | 17,157 10 |

### Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday April 6, and during the year 1872, compared with the corresponding period of 1871.

WEEK.

| | To C. & O. Canal. Tons. Cwt. | To E.&O.R.R. Co Tons Cwt. | Total. Tons. Cwt. |
|---|---|---|---|
| 1872 | 19,322 10 | 24,972 01 | 44,294 11 |
| 1871 | 18,394 02 | 31,446 10 | 49,840 12 |
| Increase | 928 08 | | |
| Decrease | | 6,474 09 | 5,546 01 |

YEAR.

| | | | |
|---|---|---|---|
| 1872 | 44,823 04 | 270,842 18 | 315,666 02 |
| 1871 | 68,275 09 | 251,695 12 | 319,971 01 |
| Increase | | 19,147 06 | |
| Decrease | 23,452 05 | | 4,304 19 |

### Cumberland Branch R. R.

WEEK.

| | To C. & O. Canal Tons. Cwt. | To B.&O. R.R. C. Tons. Cwt | Total. Tons Cwt. |
|---|---|---|---|
| 1872 | 5,478 05 | 485 07 | 5,963 12 |
| 1871 | 5,675 01 | 1,593 18 | 7,268 19 |
| Increase | | | |
| Decrease | 196 16 | 8 11 | 1,305 07 |

YEAR.

| | | | |
|---|---|---|---|
| 1872 | 13,878 06 | 775 17 | 14,654 03 |
| 1871 | 21,971 00 | 19,939 15 | 41,910 15 |
| Increase | | | |
| Decrease | 8,092 14 | 19,163 08 | 27,256 12 |

### Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

| | AT NEW YORK. April 12. R. A. | W. A. | AT PHILADELPHIA. April 12. R. A. | W. A. |
|---|---|---|---|---|
| SCHUYLKILL. | | | | |
| Lump | $- — | $- — | - — | |
| Steamer | - — | - — | - — | - — |
| Broken | - — | - — | - — | |
| Egg | - — | - — | - — | - — |
| Stove | - — | - — | - — | - — |
| Chestnut | - — | - — | - — | |
| Pea | - — | - — | - — | - — |
| LEHIGH. | | | | |
| Lump, (along side) | 5 00 | —— | - — | - — |
| Broken | 4 75 | - — | - — | - — |
| Egg | 4 50 | - — | - — | - — |
| Stove | 5 25 | - — | - — | - — |
| Chestnut | 4 25 | - — | - — | - — |
| Pea | - — | - — | - — | - — |
| SPECIAL COALS.* | | | | |
| Honey Brook, Le'h | W.A. 4 00@4 75 | | - — | - — |
| Spring Mountain | " " - —@- — | | - — | - — |
| Sugar Creek | " " - —@- — | | - — | - — |
| Sugar Loaf | " " - —@- — | | - — | - — |
| Old Comp'y's | " " 4 00@4 75 | | - — | - — |
| Room Run | " " 4 00@4 75 | | - — | - — |
| McNeal | " " - — | | - — | - — |
| Girardville | " " - — | | - — | - — |
| Hill & Harris | " " - — | | 3 10@4 00 | - — |
| Shamokin | " " - — | | - — | - — |
| Lykens Valley | " " - — | | - — | - — |
| Broad Top | " " - — | | - — | - — |
| McMichael | " " - — | | 3 25@4 25 | - — |
| Henry Clay | " " - — | | - — | - — |
| Powelton | " " - — | | - — | - — |

Dealers in these coals may be found in our advertising columns.

### Company Coals.

April, 1872.

| | L. | Str. | Gra | Eg. | Sto | Chest |
|---|---|---|---|---|---|---|
| *Scranton at E. Port | 3 47 | 3 53 | 3 60 | 3 63 | 4 19 | 3 58 |
| *Pittston at Newburg | 3 80 | 3 80 | 3 95 | 4 05 | 4 30 | 3 80 |
| *Lackawana at Weehawken | 3 75 | 3 75 | 3 85 | 3 85 | 4 25 | 3 75 |
| Wilk'b're at Hoboken | 3 75 | 3 75 | 3 85 | 3 85 | 4 25 | 3 80 |
| Old Co. Lehigh at Pt John'n | 5 25 | — | 4 40 | 4 40 | 4 60 | 4 26 |
| Lehigh at Eliz. Port | 5 00 | — | 4 25 | 4 25 | 4 50 | 4 00 |

For freights to different points see "Freights."
* To contractors only.

### Bituminous Coals (Cumberland).

| | |
|---|---|
| Georgetown, F.o.b. | $4.25 |
| Baltimore " | 4.70 |
| New York " | 6.75 |

### Prices of Gas Coals.

April, 1872.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 41-43 Pine st., N. Y.
Duty, $1 25, gold

| | Coarse | Slack. |
|---|---|---|
| Block House | $1 60 @ | 1 75 |
| Gowrie | 1 60 @ | 1 75 |

Corrected by Bird, Perkins & Job, 86 South street.

| | Coarse. | Culm of Coal, |
|---|---|---|
| Pictou | $2 25 @ | 1 25 |
| Sydney | 2 25 @ | 80 |
| Lingan | 1 60 @ | 80 |
| Little Glace Bay | 1 60 @ | 1 00 |
| Caledonia | 1 60 @ | 80 |

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty $1 25 per ton, gold, on the coarse coal. 25 per cent. ad valorem on the Culm of Coal

AMERICAN.

| | Currency. |
|---|---|
| Westmoreland | $7 00 @ — |
| Fairmount Gas Coal Co. of N. Y. | 7 00 @ — |
| Despard Coal Co | 7 00 @ — |
| Penn | 7 00 @ — |
| Newburg Orrel Gas | — @ — |
| West Fairmount Gas Coal | 7 00 @ — |

AT PHILADELPHIA.

| | |
|---|---|
| Powelton | $6 75 |

TO NEW YORK.

| | |
|---|---|
| *Provincial* | |
| Sidney | $3 25 |
| Lingan | 3 25 |
| Cow Bay | 3 37½ |
| Port Caledonia | 3 37½ |
| Little Glace Bay | 3 25 |

### Prices of Foreign Coals.

April, 1872.

Duty $1 25 per ton.

Corrected weekly by PARMELE BROS., No 32 Pine street, N. Y.

| | |
|---|---|
| Liverpool Gas Caking | $ 8 00@— — |
| " " Cannel | 12 00@13 00 |
| " House " | 18 00@20 00 |
| " Orrel | 14 00@16 00 |

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

| | |
|---|---|
| Liverpool House Orrel, screened | $16 00@17 50 |
| "Cannel, " | 20 00@25 00 |

Per ton 2,000 lbs. delivered.

**Freights.**—April, 1872.

| TO EASTERN PORTS. | Cumberland. From Georgetown. | Cumberland. From Baltimore. | Anthracite. From Philadelp'a. | Anthracite. From Elis. Port, Port Johnston, and Hoboken. | Anthracite. From Newburg. | Anthracite. From Rondout. |
|---|---|---|---|---|---|---|
| Amesbury | | | | | | |
| Bangor | | | | | | |
| Bath | | | | | | |
| Boston | 3 25 | 3 75 | 3 75 | 2 60 | | 2 90 |
| Bridgeport | 2 50 | 2 75 | | 1 00 | | 1 25 |
| Bristol | | | | 1 60 | | 1 85 |
| Derby | 3 00 | | | 1 25 | | |
| Dighton | 2 75 | 2 75 | | | | |
| East Cambridge | | | | | | 1 85 |
| Fall River | | 2 75 | | 1 65 | | |
| Hackensack | | | | | | |
| Hartford | | | | | | 1 75 |
| Hoboken | 2 10 | | | | | |
| Jersey City | 2 10 | 2 00 | | 50 | | |
| Middletown | | | | | | 1 50 |
| Mystic | | | | 1 20 | | |
| New Bedford | 2 80 | 3 00 | | 1 60 | | 1 85 |
| Newburyport | | 3 50 | | 2 75 | | 3 10 |
| New Haven | 2 60 | 2 75 | | 1 00 | | |
| New London | 2 75 | 2 75 | | 1 40 | | 1 25 |
| Newport | | | | 1 60 | | 1 80 |
| New York | 2 15 | 2 30 | | 50 | | 65 |
| Norwalk | | | | 1 00 | | 1 25 |
| Norwich | | | | 1 50 | | 1 60 |
| Pawtucket | | | | | | 1 95 |
| Portland | | 3 35 | | 2 65 | | 3 10 |
| Portsmouth, N.H | | 3 75 | | 2 65 | | |
| Providence | 2 75 | 2 75 | | 1 60 | | 1 85 |
| Rockport | | | | | | |
| Saco | | | | | | |
| Sag Harbor | | 3 75 | | | | |
| Salem | | 3 50 | | 2 50 | | 2 90 |
| Stamford | | | | | | |
| Stonington | | | | 1 20 | | 1 65 |
| Taunton | | | | | | |
| Warren | | | | | | |
| Washington | | | | | | |
| TO RIVER PORTS. | | | | | | |
| Albany | | | | | 55 | |
| Catskill | | | | | 50 | |
| Cocksackie | | | | | 50 | |
| Coeyman's | | | | | 65 | |
| Cold Spring | | | | | 20 | |
| Fishkill | | | | | 20 | |
| Haverstraw | | | | | 40 | |
| Hudson | | | | | 40 | |
| New York | | | | | | |
| Nyack | | | | | 45 | |
| Poughkeepsie | | | | | 30 | |
| Rhinebeck | | | | | 30 | |
| Rondout | | | | | | |
| Saugerties | | | | | 40 | |
| Sing Sing | | | | | 50 | |
| Stuyvesant | | | | | | |
| Tarrytown | | | | | 50 | |
| Troy | | | | | 75 | |
| West Point | | | | | 20 | |
| Yonkers | | | | | 50 | |

### Rates of Transportation to Tide Water.

*BY RAILROAD.*

TO PORT RICHMOND, PHILADELPHIA.

| | |
|---|---|
| Philadelphia and Reading Railroad, from Schuylkill Haven for consumption | $1 85 |
| For reshipment | 1 75 |

MAUCH CHUNK TO ELIZABETHPORT.

| | |
|---|---|
| L. V. Railroad from Mauch Chunk to Phillipsburgh | $0 66 |
| C. R. R., N. J., Phillipsburgh to Elizabethport | 0 98 |
| Shipping expenses at Elizabethport | 25 |
| Wharfage | 10 |
| Total | $1 99 |

MAUCH CHUNK TO PORT JOHNSON.

| | |
|---|---|
| L. V. R.R., or L. & S. R.R. from M. C. to Phillipsb'g | $0 66 |
| C. R. R., of N. J., Phillipsburgh to Pt. Johnson | 0 98 |
| Shipping expenses | 25 |
| Wharfage | 10 |
| Total | $1 99 |

TO HOBOKEN.

| | |
|---|---|
| L. V. R. R., Mauch Chunk to Phillipsburgh | 66 |
| Morris & Essex R. R. Phillipsburgh to Hoboken | 0 98 |
| Shipping expenses | 25 |
| Wharfage | 10 |
| Total | $1 99 |

TO SOUTH AMBOY.

| | |
|---|---|
| L. V. R. R. | 66 |
| B. & D. R. R. | 83 |
| Cam. & Am. R. R. | |
| Shipping Expenses | 35 |
| Total | $1 84 |

PENN HAVEN TO ELIZABETHPORT.

| | |
|---|---|
| L. V. R R. Penn Haven to Phillipsburgh | 0 78 |
| C. RR. of N. J. Phillipsburgh to Elizabethport | 0 98 |
| Shipping expenses | 25 |
| Wharfage | 10 |
| Total | $ 2 11 |

## MARKET REVIEW.

FOR THE WEEK ENDING APRIL 11, 1872.

IRON—The market for Scotch Pig remains quiet, but, with a light stock and small receipts, prices are supported; 100 tons Glengarnock sold, to arrive, at $49, cash; parcels, on the spot are quoted $52a$53, and Eglinton $52a $55, ex ship and store. There is a good demand for American for future delivery, but spot parcels meet with very little attention. There is, however, very little offering, and holders are firm at quoted rates; a sale is reported of 1000 tons Crane, season delivery, on private terms. Wrought Scrap is scarce and in demand, at the advance noted in our last; 100 tons No. 1 sold at $65 from yard. New Rails continue in moderate request, and we notice sales of 2000 tons 56 pounds English at $75 gold. American are quoted $83a$85 currency, according to location of mill. The market for Bar from store continues very strong, and an advance is imminent—we understood the Trade would meet to-day, though it was not generally known. The Pennsylvania makers continue very strong, and advances take place almost every week.

PHILADELPHIA, April 8.—(From Circular of Edward Samuel.)—The Pittsburgh mills have again advanced the price of Merchant Bar, making their mill price 5 cents. The market for Pig continues firm at quoted prices. Below are the closing prices: American No. 1 Foundry Pig at furnace $48a49, No. 2 $47a48, No. 3 Forge $45a46, No. 4 White and Mottled $42a43, American refined bar, mill price, $100, and rails, at mill, $82a85.

COPPER—The manufactures of copper have been further advanced five cents per pound on all kinds excepting Nails, which are four cents higher. We now quote: Sheathing, over 12 oz., 46 cents; Braziers, ordinary size, over 16 oz., per square foot, 48; 16 and over 12 oz., 51; all Sheets 12 oz. per square foot, and lighter, 54; Circles less than 84 inch in diameter, 51; 84 inch and over, 54; Segment and Pattern sheets, 51; Locomotive Fire Box sheets, 48; Bolts, 48; and Nails, 51, net cash. In Ingot there is less excitement, but the upward movement in prices has made further progress, and we advance our quotations 1@2 cents per pound. The business in spot lots is necessarily small, but for future delivery the contracts have again been pretty large. The sales and resales for immediate delivery are about 100,000 pounds Lake, in small parcels, commencing at 42 cents and closing at 44, with 45 now asked; and for delivery from June to October, 1,500,000 pounds at 35½a36. The latest cable quotations from London are, for Chile bars £99a£101, and for best selected £104a£106.

LEAD—Ordinary foreign is neglected, the Government supplying chiefly the small demand. Refined is scarce and wanted at 6¾a6⅞ cents gold; bar 8½ cents, sheet and pipe 10, and tin-lined, 15, less 10 per cent to the Trade.

SPELTER—Has been very quiet; 7¼a7½ cents gold is obtained for small lots Silesian on the spot; to arrive 7a7¼ cents is the quotation.

STEEL.—All kinds are steady and firm at our quotations, which are the prices for lots as wanted from store.

TIN—Telegrams from Europe and the East advise higher prices. From London the quotation com s;

Straits £157, and English £160, from Singapore £39 per picul paid. The Batavia sale of Monday embraced 7200 piculs Billiton at 99½ florins, equal to 43 cents gold here. These accounts have further stimulated the demand, and the business is quite large with some excitement, and an advance in prices of 1½@2 cents per pound. The sales are 2500 slabs Straits at 40¼ cents; 2500 do., to arrive, 39¾; 15 tons English, 40; and 5 do., to arrive, 39½. The closing prices were 42 cents for Straits, 41 for English, and 50 for Banca, all gold. Plates continue in request, and are firm and buoyant at the advance noted in our last. Sales have been made of 1000 bxs. Charcoal Tin, to arrive, at $13 37½; 3200 do. I. C. Coke, 10 by 14 and 14 by 20, $11 75a12; 500 do. inferior, $11 62½; 3750 do. Charcoal Terne, $11 50a12; 700 do Coke Terne, good brands, part A. G., $10 75; and 1500 do. ordinary, $10 37½a10 50, all gold.

ZINC—Mosselmann sheet is steady at the advance noted last week, with sales of 150 casks from agents' hands, to arrive, at 9½ cents, less 4 per cent., gold. Am. Dry 7a7½, French 8¾, Metallic 11, Manganese 4½. per lb.

## METALS.

NEW YORK, April 11, 1872.

IRON.—Duty: Bars, 1 to 1¼ cents ℔ lb; Railroad, 70 cents ℔ 100 lbs.; Boiler and Plate, 1½ cents ℔ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ℔ lb; Pig, $7 ℔ ton: Polished Sheet, 3 cts. ℔ lb; Galvanized 2½; Scrap Cast, $6; Scrap Wrought, $8 per ton

| | *Store Prices.* |
|---|---|
| Pig, Scotch No. 1, ℔ ton | 50 00@55 00 |
| Pig, American, No. 1 | 50 00@52 — |
| Pig, American, No. 2 | 49 00@50 — |
| Pig, American, Forge | 47 00@48 — |
| Bar Refined, English and American | 100 00@105 00 |
| Bar Swedes, assorted size ( | 85 00@100 00 |
| | *Store Prices, Cash.* |
| Bar, Swedes | 120 00@130 00 |
| Bar, Refined, ⅜ to 2 in. rd. & sq. 1 to 6 in. x ⅜ to 1 in. | 105 00@— — |
| Bar, Refined, 1¼ to 6 by ¼ & 5:16 & 2½ to 2⅝ rnd. sq. | 110 00@— — |
| Bar, Refined, 1 & 1⅛ by ¼ & 5:16 | 112 50@— — |
| Large Rounds | 117 50@122 50 |
| Scroll | 117 50@147 50 |
| Oval and half-round | 120 00@130 00 |
| Band | — —@117 50 |
| Horse Shoe | 117 50@125 50 |
| Rods, ⅜ to 3-16 inch | 110 00@150 00 |
| Hoop | 130 00@172 50 |
| Nail rod | 7¾@— — |
| Sheet, Russia, as to assortment (gold) | — 45 18 ½ |
| Sheet, Singles, D. and T. Common | —6 @— 7 |
| Sheet, D. and T. Charcoal | —7½@— 8 |
| Sheet, Galv'd, Nos. 10 to 27 | 10@13c lb. |
| " Nos. 28, and 29 | 15@19c lb. |
| Rails, English (gold), ℔ ton | 74@75 00 |
| Rails, American, at Works in Pa | 83@85 00 |

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 4 cents ℔ lb; Manufactured, 45 per cent. ad val.

| | *All Cash.* |
|---|---|
| Copper, New Sheathing, ℔ lb | — @— 48 |
| Copper Bolts | — @— 48 |
| Copper Braziers, 16oz. and over | — @— 48 |
| Copper Nails | — @— 51 |
| Copper, Old Sheathing, &c. mixed lots | — @— — |
| Copper, Old, for chemical purposes, 14@16 oz | — @— — |
| Copper, American Ingot | 44 @— 45 |
| Yellow Metal, New Sheathing & Bronze | — @— 30 |
| Yellow Metal Bolts | — @— 32 |
| Yellow Metal Nails | 30 @— 32 |

LEAD.—Duty: Pig, $2 ℔ 100 lbs.; old Lead, 1½ cents ℔ lb; Pipe and Sheet, 2¾ cents ℔ lb.

| | |
|---|---|
| Galena, ℔ 100 lbs | $— @— — |
| Spanish (gold) | 5 90 @6 00 |
| German, do. | 5 90 @6 00 |
| English do. | 5 95 @6 80 |
| Bar (net) | 8 50 @— — |
| Pipe (net) | — — @10 00 |
| Sheet | — — @10 00 |

Colwell, Shaw & Willard Tin-Lined Lead Pipe 15 cts. ℔ lb.

STEEL.—Duty: Bars and ingots, valued at 7 cents ℔ lb or under, 2¼ cents; over 7 cents and not above 11, 3 cents ℔ lb; over 11 cents, 3½ cents ℔ lb, and 10 ℔ cent ad val. (Store prices.

| | |
|---|---|
| English Cast (2d and 1st quality) ℔ lb | — 16 @— 18 |
| English Spring (2d and 1st quality) | — 7 @— 10 |
| English Blister (2d and 1st quality) | — 10 @— 17 |
| English Machinery | — 11 @— 13 |
| English German (2d and 1st quality) | — 10½@— 12 |
| American Blister "Black Diamond" | — — @— 12 |
| American, Cast, Tool do. | — 15 @— 16 |
| American, Spring, do. | — 9 @— 11 |
| American Machinery do. | — 9 @— 10 |
| American German, do. | — 9 @— 11 |

TIN.—Duty: Pig, Bars, and Blocks, 15 ℔ cent. ad val.; Plate and Sheets and Terne Plates, 25 ℔ cent.; Roofing 25. ad val.

| | *Gold* ℔ lb. |
|---|---|
| Banca | — @50 |
| Straits | — @42 |
| English | 39¾@41 |

| PLATES. | *Fair to Good Brands.* | *Gold.* | *Currency.* |
|---|---|---|---|
| I. C. Charcoal, ℔ box | $13 75 | @14 00 | $15 00 @15 50 |
| I. C. Coke | 12 00 | @12 50 | 14 50 @14 50 |
| Coke Terne | 10 50 | @10 75 | 11 75 @12 00 |
| Charcoal Terne | 11 75 | @12 00 | 13 50 @14 00 |

SPELTER—Duty: In Pigs, Bars & Plates, $1.50 p. 100 lb

| | | |
|---|---|---|
| Plates, Foreign | (gold) p. 100 lb. | 7 12½@ 7 37½ |
| Plates, Domestic | p. lb. | — 7 @— 11 |

ZINC—Duty: Pig or Block, $1.50 per 100 lb.; Sheet 2½c per lb

| | |
|---|---|
| Sheet | per lb.— 10½@— 11 |

### San Francisco Stock Market.

BY TELEGRAPH.

Our report from the San Francisco Stock Market is dated the 9th inst. Without exception the market has advanced; Belcher forms the most prominent feature in the list having advanced $100 per share during the week. Reference to the annexed table exhibits the quotations for the dates of the 5th and 9th inst.; it will be observed on a comparison of the two that the advance is general and uninterrupted.

| | April 9. | April 5. |
|---|---|---|
| Savage | 365 | 317 |
| Yellow Jacket | 135 | 105 |
| Kentuck | 320 | 275 |
| Chollar Potosi | 97 | 79 |
| Gould & Curry | 307 | 277 |
| Belcher | 775 | 670 |
| Imperial | 224 | 207 |
| Eureka C. V. | — | — |
| Amador | — | 300 |
| Meadow Valley | — | — |
| Hale & Norcross | — | — |
| Ophir | — | — |
| Alpha | — | — |

### Mining Stocks.

NEW YORK, April 11th, 1872.

The transactions of the Mining Stock Board during the past week have been comparatively numerous, and with the exceptions of a decline in American Flag and Smith & Parmlee the gold stock list has advanced. Hilton "copper" is quoted at from $1.55 to $3, Minnesota $7.50 and Rockland $4.50 per share; the following is the report:

| | BID. | ASKED. |
|---|---|---|
| American Flag | 19 | 20 |
| Bates & Baxter | 30 | 40 |
| Benton | — | — |
| Black Hawk | 60 | 1 00 |
| Casco Gold | — | — |
| Central Gold | 5 | 7 |
| Cons Gregory | 25 | 40 |
| Grass Valley | 7 | — |
| Gunnell | 20 | — |
| Holman | — | — |
| La Crosse | 32 | 38 |
| Liberty | 1 | 3 |
| Mariposa prf | 2 | — |
| Rocky Mount | 3 | — |
| Quartz Hill | 29 | 30 |
| Smith & Farm | 33 | 35 |

### Petroleum.

Petroleum is nominally unchanged, the sales during the week has been confined to several transfers of Central at 50c. per share; the quotations are as follows:

| | BID. | ASKED. |
|---|---|---|
| Bennehoff Run | 20 | 30 |
| Blood Farm | 5 | — |
| Brevoort | 1 75 | 2 50 |
| Buchanan Farm | 40 | 40 |
| Central | 50 | 60 |
| Home | 1 35 | 1 50 |
| New York & Allegheny | 1 25 | — |
| Northern Light | 30 | — |
| Phillips Pet | 5 | 15 |
| Pithole Creek | — | 1 00 |
| Rathbone Oil | 20 | — |
| Rynd Farm | 25 | 30 |
| Second National | — | 40 |
| United Petroleum Farms | 28 | 40 |
| United States | — | 55 |
| Bergen Coal and Oil | — | 50 |
| Bliven Oil | — | 50 |
| Clinton | — | — |
| National | — | — |
| Sherman & B | — | — |
| Tarr Farm | — | — |
| Webster | — | — |

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Lines of Property,

and Names of Land Owners.

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and occupied in its compilation a period of over

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## Rolling vs. Hammering Ingots.

By A. L. HOLLEY, ESQ.*

In order to put sufficient *work* on steel ingots for rails, they must be reduced from about 12 in. square. As this cannot be done at one heat, they are first drawn down to about 7 in. square, and then reheated and rolled into rails. This first reduction or "blooming," is usually done in this country in a 30 in. 3-high rolling mill, with movable rolls, so as to get several reductions in each set of grooves. The first of these mills has been running at the Troy Steel Works above a year, with great success. Another at the Cambria Iron Works has been running above 6 months, and has produced 140 tons of rail blooms from 12 in. ingots in 24 hours. The mill was not then fully employed, the limit of capacity being a single Siemens heating furnace.

The practice is now being introduced of rolling long 12 × 14 in. ingots, instead of short 12 × 12 in. ingots, thus producing 3 rail blooms at one rolling, instead of two, and saving largely in labor and fagends. As the handling of the piece at the rolls, and indeed its charging and discharging at the furnaces, are performed by steam power, the large ingot requires no more men than the small one. The capacity of a blooming mill, rolling 3-rail ingots, may be safely put at 200 tons per day.

In England, and also at the Pennsylvania Steel Works at Harrisburg, the rail ingots are reduced to blooms by hammering, usually under 10 to 15 ton hammers. The 13 ton hammer at Harrisburg is a first class tool and the practice with it is unusually good. Its maximum production is about 75 tons of blooms per day, or much less than half that of a rolling mill which costs, with its engine, about the same money. A smaller number of men and less skilled and high priced men are employed at the rolling mill. By the use of Mr. FRITZ's feeding tables, the labor at the rolls is reduced to little more than directing the operations of the machinery.

Three-rail ingots cannot be advantageously handled under a hammer.

The impression has heretofore existed among railway men, that the quality of what they call hammered rails is superior to that of rolled rails. The use of the *rails* has not developed this impression so far as can be ascertained. The impression is founded on the fact that *iron* is improved by hammering and that the highest priced steel—such as tool steel—is hammered rather than rolled.

It is true that the pressure of the hammer is greater and more concentrated than that of the *light rolls usually employed*, and that the hammer may expel more cinder, in the early stages of the *iron* manufacture. The real reason why the hammer is used, in iron mills, however, is because it will work large and hard puddle balls and piles for which there is no adequate rolling machinery at hand. That rolls are preferred to hammers, even for iron, in the most improved practice, is shown by the introduction of very heavy squeezers instead of hammers, for reducing the large puddle balls of the Danks' furnace.

The hammer certainly increases the density of an iron or a steel bar, as compared with rolling. The rolls crowd the fibres back, as well as towards the centre; the action of the hammer is exclusively towards the centre. This is conspicuously shown in treating large ingots. The velocity of the hammer is greater than that of the periphery of the roll hence the effect of its impact is greater on the *surface* of the ingot, while that of the rolls is more distributed throughout the thickness of the ingot. It would therefore be supposed that the hammer would *draw* the surface of the ingot so much as to leave concavities in its ends. The rolled bloom is cup-ended, *although* it is more uniformly condensed than the hammered bloom. The result of this must be, and the fact is, that the rolled ingot is less dense; it weighs less per cubic inch, but at the same time it is more uniform in structure. Now this density does not promote toughness in *steel*, whatever it may do in iron, while uniformity *does* promote toughness, and this is the quality to be most carefully looked after in the steel rail manufacture. Nearly all steel rails are hard enough for wearing purposes, and their hardness can be increased by chemical means, with the greatest uniformity and convenience—indeed the trouble is to sufficiently keep down phosphorus, silicon and other hardening agents.

It is stated that the carbon in hammered steel is chemically combined, while that in rolled steel is graphitic. If this is the fact in regard to rails, it is a strong argument in favor of rolling. As we have just observed, steel-makers, with the irons they have, find difficulty enough in making their rails mild and tough, without being subjected to the additional embarassment of chemically combined carbon. It is well known that the tool makers' process of hardening is simply combining the carbon, while *annealing*—that safety process to which boiler plates and forgings are subjected to give them toughness, consists in simply rendering this carbon graphitic—the same thing that rolling is said to do.

But, in fact, rail-makers are not embarrassed by the hardening process imputed to hammering, because there is no such thing as a hammered rail, or as a structural condition of rail due to hammering. Whatever the condition of carbon in a hammered *bloom*, it is graphitic in the rolled *rail*. The reheating of the bloom, and its subsequent treatment by rolling alone, probably leave the physical condition of the steel substantially the same as if it had been rolled rather than hammered *before* reheating—excepting only the condition before mentioned, due to the character of the pressure—the rolled steel is less dense, and is more uniform. This uniformity is further increased by the fact that the temperature of a rolled ingot is practically the same at each pass, while the hammered ingot is reduced at varying temperatures.

A very large number of experiments have been made, at Troy and Johnstown, on rolled and hammered ingots from the same steel, and although the results confirm the above reasoning, rather than contradict it, the difference in the quality of the rails is not very marked. In fact, a large number of rails rolled direct from 9-inch ingots, are wearing as well, so far (three years) as rails made from either hammered or rolled 12-inch ingots. In making *complete* tests—tests to destruction—it is unnecessary to say that the size of the ingots experimented on by the hammer and the rolls, should be the same. A test in which rolled 9-inch ingots are compared with hammered 12-inch ingots, has no value.

The use of hammers or rolls for blooming seems to resolve itself, then, into a question of cost of product, as it has been impossible to establish, so far, any marked difference in quality—certainly none in favor of hammering.

We have shown that the rolling mill has over twice the capacity for a given cost, and that it employs less labor. Another advantage of the rolls is, that their collars hold up the corners of the bloom, thus reducing its cracking, and making sounder rails, as well as a larger number of first quality rails from a given number of ingots. Rolled blooms are of exactly uniform cross section, while hammered blooms must vary considerably. Hence the crop ends of the former may be reduced to a uniform minimum, while a large allowance must always be made in hammering.

* From a paper read before the American Institute of Mining Engineers at Philadelphia; February 1872.

## Electro-Magnetic Engines.

We take the following from an article on the subject in the English *Mechanic's Magazine*:

Although the idea of employing electricity as a motive power is by no means new, yet but little progress has been made in its mechanical application. This is not due to any defect in the mechanical construction of the electro-magnetic engines, but arises almost entirely from the batteries employed to impart motion to them, and it is highly improbable that these machines will ever take a standing in the engineering world, as a means of executing mechanical work, or will cease to be, as they now really are, mere mechanical toys and scientific curiosities, until a very considerable step is made towards providing a constant, simple, and above all cheap—as regards their consumption of metals and acids—form of battery. Even if an economical form of battery be discovered, it is more than doubtful whether these engines can compete with steam engines in giving out a fair equivalent of the force expended in moving them, as it should be recollected that the enormous pull of a powerful electro-magnet, from which the power is obtained, exists only when the attracted armature is in actual contact with the poles, and that the least separation of the armature decreases this pull very rapidly, not merely because magnetic force follows the law of the inverse squares of the distances, but because that separation destroys, in a very great degree, the actual magnetism of the magnet. The one great advantage of electro-magnetic engines is that when not in use there is no waste of power; as in the case of a steam engine, when it is stopped, the fire continues to burn, and all the heat produced cannot be retained until wanted again, whereas, when electricity is used, the moment the machine stops the battery ceases working, and remains so until again required. So far, then, when a motive power is required at frequent intervals and not for continuous use, an electro-magnetic engine may be of service, and even economical.

Various estimates have been made by different physicists as to the available mechanical effect to be obtained by the consumption of zinc in a battery used with these machines. Page stated that the consumption of 3 lbs. of zinc per day would produce 1-horse power. Joule estimates the consumption necessary to produce 1-horse power in 24 hours to be 45 lbs. in a Grove, and 75 lbs. in a Daniell battery. A grain of coal consumed in a Cornish engine will raise 143 lbs. one foot, whereas a grain of zinc consumed in a voltaic battery can raise theoretically only 80 lbs. Taking then the price of coal at ninepence per cwt., and that of zinc at 216 pence per cwt., it would result that under the best conditions, the magnetic force is twenty-four times more expensive than that of steam. It is therefore clear that until a far cheaper substance than zinc is employed to produce the galvanic current, electricity can never compete with steam as a cheap motor. Electro-magnetic engines may be divided into two classes—1st, those which work by direct alternating movements; 2nd, those in which motion is produced by the magnets acting direct on to the circumference of a wheel, without the medium of cranks and connecting rods. Of these two kinds, M. DUMONT says:—"Other things being proportional, electro-magnetic engines with direct alternating movements present a great superiority over rotating machines, since in the first there are no components lost, and with the same expense a much more considerable power is obtained than with rotating machines, and also in machines of direct movement, the influence of the induction currents appears less considerable than in rotating machines. The varieties of these machines are so numerous, and are mostly so generally known, that it is unnecessary to describe them here.

## The Geological Survey of California.

We are pleased to learn that the work of the Geological Survey of California is to proceed, two thousand dollars per month having been appropriated to defray the expenses. Professor Whitney has an able corps of assistants to aid him in his work, which, when complete, will be of immense value to the inhabitants of the State, both directly and indirectly. They will be enabled to select locations for farming or mining purposes intelligently within their own borders, and outsiders, by being enabled to get reliable and accurate information concerning the vast mineral and agricultural resources of the State will be led to consider more seriously offers made to them for investments, or the propriety of immigrating thither themselves.

# THE ENGINEERING AND MINING JOURNAL.

ROSSITER W. RAYMOND, Ph. D.,
WILLARD P. WARD, M. E.
Editors.



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THE ENGINEERING AND MINING JOURNAL *is projected in the intent of furthering the best interests of the Engineering and Mining public, by giving wide circulation to original special contributions from the pens of the ablest men in the professions. The careful illustration of new machinery and engineering structures, together with a summary of mining news and market reports, will form a prominent feature of the publication.* It is the Organ of the American Institute of Mining Engineers, and is regularly received and read *by all the members and associates* of that large and powerful society, *the only one of the kind in this country.* It is therefore the best medium for advertising all kinds of machinery, tools and materials used by engineers or their employees.

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## Office Removal.

We desire to call attention to the removal of our office from its present location to No. 27 Park Place, which will take place on May 1st.

As will be seen by the Bulletin in another column, the May meeting of the American Institute of Mining Engineers will be held in this city, commencing on the evening of Tuesday the 21st inst. Further particulars will be announced in due time. For the present it is sufficient to say, that the lecture-rooms and apparatus of the Cooper Union have been generously offered to the Institute for its sessions, and that preparations are in progress which promise to render this gathering, both socially and professionally, one of the most interesting and profitable in the history of the organization.

## Gruner on Steel.

THE treatise of Professor M. L. GRUNER, of the *Ecole des Mines*, on the manufacture of steel, has been translated by Mr. LENOX SMITH, a graduate of the Columbia School of Mines, and published by Van Nostrand, in a handsome and convenient volume of 193 pages octavo, accompanied with lithographed plates. The appearance of this work indicates the growth in this country of an appreciative and inquiring professional public, such as, a few years ago, we had hardly begun to possess. The rapid development of our iron and steel industry has been accompanied with encouraging progress in the means of scientific and technical training; and American metallurgists are now competent, while American manufacturers are willing, to avail themselves of the consolidated experience of other countries, and to create out of its judicious combination with domestic practice a perfected system, adapted to our national conditions.

GRUNER'S work is not a manual of instruction for beginners. It does not rival the detailed thoroughness of PERCY, WEDDING and KERL. What it attempts is to review the whole field of the present condition of the steel manufacture, and to point out with discrimination and clearness, the nature and bearings of the recent steps of progress in that field. Whoever is acquainted with this subject will admit that such a treatise is timely and useful. The world has taken a new departure in this art; new possibilities loom up before us; new agencies of power, new criteria of judgment, are placed in our hands; a new map, on which the new roads are laid down, is just what we want, to *orient* ourselves upon the journey of progress. Something like this is furnished by the work before us. Before briefly reviewing its contents, we may remark that the translator's work has been performed with evident care, and that the text, so far as we observe, is correct and fluent. The original Appendix will be noticed hereafter.

In his introduction on the nature of steel, GRUNER reiterates what KARSTEN asserted fifty years ago, that the series, beginning with the most impure black iron, and ending with the softest and purest wrought iron, comprises steel; but that it cannot be said where steel begins or ends. The best practical classification is based on physical properties, though corroborated by the chemical analysis. Cast iron is not malleable, at least when heated, but may be tempered by being suddenly cooled. Wrought iron is malleable hot and cold, but not capable of tempering; every intermediate product, which may be tempered, but which remains malleable, hot and cold, when not tempered, is practically steel, however produced. These differences are more or less affected by various ingredients; but the essential element, affecting hardness and temper, is the proportion of carbon held in solution.

The methods of steel manufacture are classed under two heads: *Direct fining*, as wrought-iron is produced; and *Recarburation* of wrought-iron. Under these heads GRUNER treats of direct fining without fusion (oxidizing cementation of pig-iron); fining fluid pig, with solid fined products (forging, puddling); and fining fluid pig, with fluid fined products. This latter method comprises the processes of BESSEMER, BERARD etc., and, when solid agents, such as iron, or oxide of iron, are employed, the MARTIN process. Under the head of recarburation are placed the processes founded on cementation.

It is easy to see that the above classification is defective. BESSEMER and MARTIN recarburize wrought-iron, just as truly as PARRY. It may be theoretically possible to stop the process in a BESSEMER converter when the bath contains steel; but practically the bath becomes wrought-iron, and is refined and recarburized by the addition of spiegeleisen. And the MARTIN method, though it may be so employed as to decarburize gradually, and arrest the operation at the degree desired, is in practice prolonged until the iron is burnt, and recarburation is effected by fresh additions of pure pig metal.

The greater part of the treatise is devoted to the BESSEMER and the MARTIN processes. Under these heads a great deal of information is given concerning European practice, and some critical observations are made which seem to us quite sound, if not entirely new; but the impression produced by the whole is that of a desultory rather than a logical and comprehensive treatment. For students, therefore, even these longest chapters are incomplete and difficult; for educated and experienced iron masters, they have great value, by reason of their clear presentation of the notes of foreign experiment on important points.

The Appendix contains a remarkably forcible and convincing description of the American Bessemer plant, and its advantages over foreign works. We may well be proud of our acknowledged superiority in this field. BESSEMER has himself confessed, that the American works produce more steel from the same capacity of machinery than any abroad, by reason of the ingenuity and boldness with which such experts as HOLLEY and FRITZ have increased the convenience and rapidity, while lessening the manual labor of the process.

## Young Graduates.

A correspondent begs us to inform him what position a young man without influence, after graduating engineer of mines, can reasonably expect to hold, and at what salary; also, whether it would be more profitable in the pecuniary sense to study mine-engineering or metallurgy. These questions we cannot definitely answer. Neither mining nor metallurgy is represented in this country by a stable industry and a well-organized profession; but a thorough mining engineer is able to fall back when occasion requires upon surveying and railway engineering, and a thorough metallurgist has a similar resource in assaying and some branches of manufacturing chemistry. In general terms, young graduates in either line should not expect to obtain at once responsible, salaried positions. They need practice before their services are really valuable; and this practice they should be content to acquire in subordinate positions. One of the legitimate advantages of a professional education in an American school is the likelihood that diligence and success as a student may attract the notice of teachers or associates, and thus lead to a favorable opening into active professional life. No man who has for years pursued any course of preparatory study ought to be entirely "without influence." If he has not in that period impressed somebody with the notion that he is faithful and intelligent, and will become a valuable assistant, then something is the matter with him.

If our correspondent means hard work, and slow but certain progress in his profession, let him study metallurgy, and devote himself particularly to iron. We hope that three or four years from now there will be chances enough for active and modest young men to be employed as scientific assistants about American iron-furnaces.

WE notice that Hon. JOHN JAY KNOX, Deputy Comptroller of the Currency, is spoken of as the probable successor to the late Comptroller, who has recently resigned. The Government could not find a more competent and worthy man for the place. Mr. KNOX has been for many years an officer of the Treasury, and has steadily made his way, by his merits, up to the responsible position he now holds. In the good time coming, ability and honesty, rather than political influence, are to decide the choice of officers; and if Mr. KNOX is now made Comptroller of the Currency, that good time will, in one case at least, be not only coming, but come.

## Complete Combustion in Furnaces.

The principle of the gas-generator is the true one, for securing the maximum combustion, and so the maximum heat, from a given amount of fuel. This is well understood in metallurgy; and the applica-

tion of the same truth was made long ago in the generation of steam, and the arrangement of domestic heating apparatus. It is the principle of Amory's house and locomotive furnaces, one of the latter of which was successfully introduced on the locomotive Hecla, of the Boston and Worcester Railroad, as long ago as 1855. That experiment was noteworthy in another respect. At the time it was made coal was not used in the locomotives of England, France or America. According to the report of Hon. Nathan Hale, Mr. AMORY demonstrated that coal could be employed at about half the cost of wood.

In all the furnaces of this class, the fuel is burned to carbonic oxide, etc., in the first process, and the hot gases of combustion are then completely oxidized by further access of air. This is done in Amory's furnaces by causing the gases to pass over curved surfaces, the exact extent and form of which has been carefully fixed by experiment, and through openings in which the fresh air is admitted to complete the combustion. It is found that the saving in fuel, calculated on equal amounts of heat produced or water evaporated, is ot less than twenty-five per cent.

In the Amory house-furnace the fire-pot does not directly (as in ordinary cast-iron furnaces) heat the air for the dwelling, but is lined with fire-brick, and is used to effect an incomplete combustion of the coal. The hot gases from this combustion escape freely through the open top of the fire-pot into a hot-air chamber, where they pass over curved surfaces, so arranged as to cause a vortex or revolution in the current, thus bringing every part into contact with fresh air, which is admitted through small openings in these surfaces. The complete oxidation thus effected produces an intense temperature, which is imparted by the gases, as they pass on into the chimney-flue, to a system of tubes, communicating below with the supply of fresh cold air, and above with the warming flues. The air admitted to the rooms is thus kept pure and perfectly free from contact, either with the red-hot iron of a fire-pot or the deliterious gases of combustion. Numerous testimonials from residents of Boston and Jamaica Plains attest the economy and efficiency of this furnace; and there is no doubt that the principle of a double combustion and an indirect heating of the air for the rooms is well founded. Mr. AMORY'S address is 15 Pemberton Square, Boston. As the peculiarities of his furnace cannot be clearly understood without inspection, at least of drawings, we recommend those interested to apply to him for further information.

## New Publications.

OREGON AND HER RESOURCES: *From Personal Observation and Investigation.* By HUGH SMALL. San Francisco: A. L. BANCROFT & Co.

This pamphlet of 130 pages, with a neatly engraved map of Oregon, contains a great deal of information such as immigrants require, concerning the climate, soil, scenery, fruits, crops, sheep and wool, pork, poultry, cattle, fisheries, timber, water-power, minerals, railways, commerce and social advantages of the State. The chapter on minerals is brief and unsatisfactory, but sufficient to indicate that lead, copper and iron will hereafter become important sources of profit, while gold, silver, salt and limestone are already the basis of active industry.

SECOND REPORT OF THE GEOLOGICAL SURVEY OF INDIANA. *Made during the Year* 1870 *by* E. T. COX, *State Geologist, assisted by* PROF. JOHN COLLETT *and* DR. G. M. LEVITTE. Indianapolis 1871.

This report is principally occupied with detailed observations of the structure and relations of the Indiana coal-formation, which is now attracting so much attention, by reason of the demonstrated excellence of the "block-coal" as a metallurgical fuel. The developments of the Indiana and Ohio surveys have greatly enlarged our knowledge of the resources of the country in this important particular, and will doubtless be followed by a rapid extension into those States of the manufacturing industries, especially those of iron and steel. Indeed, nothing seems to have delayed this progress except the lack of adequate and cheap railway transportation, which will soon be measurably removed by the completion of roads specially fitted for the coal business. Professor Cox's comprehensive paper on the Western Coal Measures and Indiana Coals, read before the American Association at Indianapolis, in August last, is included in this volume. We consider it a conclusive reply to the arguments by which it has been attempted to establish a recognized continuity or geological identity between the Pennsylvania and Western coal-measures.

We find also Dr. STERRY HUNT'S paper on the oil-wells of Terre Haute; and an interesting section of one of the deepest borings (over 1900 feet). At the close of the volume is a Manual of the botany of Jefferson County, by Mr. A. H. YOUNG; and two maps, embracing Sullivan, Daviess and Martin counties, are appended to the report.

## About-Town Jottings.

BUSINESS AND PERSONAL.

Personal announcements and business notices inserted in this column, at fifty cents per line.

Root's Wrought Iron Sectional Boiler, manufactured by the Root Steam Engine Co., 500 to 510 Second Avenue, New York.

Geo. F. Blake & Co., 79 Liberty street, Steam Pumps of every size and capacity, for all purposes.

Utica Steam Engine Co. (formerly Wood & Mann Steam Engine Co.,) 42 Cortlandt street, N. Y.

Post & Goddard have removed to No. 111 Liberty street. Dealers in Taps, Dies, Reamers, Drills and supplies generally.

American Submerged Pump. Power attachment—cheapest and best in the market, 55 Chambers street, N. Y.

Roper Caloric or Hot Air Engine, 124 Chambers St.

Blake Bros., New Haven, Conn., manufacture Stone Breaker for crushing ores and minerals of every kind into small fragments, preparatory to their further comminution by other machinery.

## American Institute of Mining Engineers.

OFFICIAL BULLETIN.

**Announcements to Members and Associates.**

I. It is believed that several names of members and associates elected at the Bethlehem meeting in Aug., 1871, have been accidentally omitted by reason of the loss of a portion of the records of that meeting. Such persons, or their friends, are requested to communicate with the Secretary.

II. All members and associates who have not paid their dues are requested to do so at once, by sending in postal orders, or check, or money, ten dollars to the Secretary.

All members and associates who pay their dues for each current year, strictly in advance, will have sent to their address, regularly and weekly, the ENGINEERING AND MINING JOURNAL, which is the organ of the Institute, and will contain the proceedings and transactions, and all important papers read before the Institute, and all notices of meetings. Back numbers cannot, as a general rule, be sent.

III. It is expected that the more important papers read before the Institute, and the debates thereon, will be published in annual or semi-annual volumes to which those members and associates will be entitled who have paid their dues.

IV. Authors of papers are requested to notify the Secretary in advance of the meetings, giving the subject and length of their papers. Attention is also called, in this connection, to Rules 12 and 13.

The annual meeting of the Institute will be held in the city of New York, commencing on Tuesday evening, May 21st, at 8 o'clock, in the Cooper Union Building, at the head of the Bowery.

## Dephosphorizing Iron Ores.

METALLURGISTS have for a long time past made great efforts to discover some practical method of dephosphorizing iron ores which would enable them to utilize many varieties of ore which, owing to the presence of phosphorus, yield only an inferior quality of iron. The quantity of ore so contaminated is enormous in many of the more recent geological formations, such as the oolitic, cretaceous, and tertiary formations, where the ore is either found in the shape of a carbonate or a hydrate of iron, always intimately contaminated by phosphate of lime. Of this character are the heavy beds of iron ore in the Middlesbrough district, in Luxembourg, Lothringen, Bavaria, Hanover, Bohemia, and many other localities. It was the phosphorus which forbade the use of a number of these ores for many years until modern metallurgists had learnt, by using larger furnaces and more limestone, and by adopting a judicious admixture of other ores, to extract a cheap and tolerable iron from them. Nevertheless, it has always been a desideratum to neutralize the injurious influence of the phosphorus in one way or the other. Some engineers have endeavored to extract the phosphorus from the ore, wherein it is contained in the shape of basic phosphate of lime, which is insoluble in water, and the object of all their exertions being to render this compound soluble by converting it into acid phosphate of lime by the action of other mineral acids, which would combine with a part of the lime, and set an equivalent of the phosphoric acid free to combine with the rest of the phosphate of lime, thus forming a super-phosphate. This idea is stated to have been lately successfully carried out by T. JACOBI, of Adalberthütte, at Kladno, near Prague, by exposing the ore to a solution of sulphurous acid in water, or to the simultaneous action of sulphurous vapors and cold water, when this acid forms a soluble compound with the lime, and at the same time converts the rest of the phosphate to the soluble form, so that it can be washed away with cold water. The inventor exhibited his process during the last meeting of the Association of German Engineers and Architects, at Prague, on November 3d, 1871. The samples of fibrous and fine grain bar iron and puddled steel made from such dephosphorized ore, and produced to the Association, were of an excellent character, and found unanimous approval. The sulphurous gas is either produced by burning sulphur or by the calcination of pyrites or other minerals containing sulphur. The same end has been attained by another engineer, B. OSANN, of Potsdam, by employing in a similar way diluted hydrochloric acid, which is obtained very cheaply in quite a novel mode. At the rock salt mines of Stassfurt and Leopoldshall, large masses of chloride of magnesium are obtained, together with the salts of potassium, and are thrown away as valueless. Now, if this chloride of magnesium, which contains always a considerable amount of water, be heated to about 110 deg. Cent., or 230 Fahr., it gives up so much water as to form trihydrated salt of chloride of magnesium, and if this is rapidly heated to the melting point of lead it is decomposed, giving up vapors of hydrochloric acid, when hydrate of magnesia is left as residue in the retort. The hydrochloric vapor acts exactly as was described of the sulphurous acid. Both of the processes above described are worthy of attention; but the information we have received concerning them is not as yet sufficiently detailed to enable us to form any decided opinion regarding their practical merits. Other metallurgists have sought to get rid of the phosphorus during the puddling of the iron, or even just before, when the pig iron runs from the taphole in the moulds. For removing the phosphorus during the operation of puddling, Director SPAMER, at Ilsederhütte, in Hanover, adds to each heat of 500 lbs. of pig iron about 6 lbs. of fluoride of calcium (fluorspar), which readily melts when brought in contact with the iron, so that it can be intimately mixed with it, when the fluorine combines with the

silicon of the iron to fluor silicon, and phosphoric acid is absorbed by the lime and carried into the tap cinder; or finely powdered fluorspar is thrown into the iron moulds before they are filled with liquid iron when tapping the blast furnace. In both instances the result obtained is said to be excellent, the cold-shortness of the bar iron having entirely disappeared. This appears to be a modification of the Henderson process, which has lately attracted much attention in this country.—*Iron Age.*

### Fire-Proof Safes.

CHICAGO, March 23, 1872.

TO THE EDITOR:

Knowing your love of the truth, and desire to show it when you find it, I drop you this line. Let me say, first, I am entirely disinterested (as you personally know) and am impelled to write thus because of my disgust at the flaring advertisements of the safe manufacturers, who advertise like this: "Tested by the Chicago Fire and found absolutely Fire-Proof." "A Clear Record." "Safe and Reliable." Then follows a long list of firms who acknowledge that their safes held in safety the papers entrusted to them.

I have looked at this matter somewhat carefully, and form this opinion. (There may be exceptions, but I know of none, and think this is the rule.)

The wind, or tornado, rather, (as it was nothing else, from about midnight until dawn Monday morning), blew from the southwest. The streets are laid out at right angles, from east to west. Contents of buildings on the north side of the street were protected by one hundred feet of space, (sixty feet of street and twenty feet of each sidewalk), the walls of the opposite buildings and their own walls. The safes were mostly very near the street, and on this side of the street generally came out all right; but those on the other side, that is, on the south side, facing north, almost universally proved worthless, as they had the whole heat of the block blowing over them. I don't know of a case where safes so situated stood the test.

By hearing only the other side of the story your readers will buy safes and rest in fancied security until, perchance, a like visitation shews the folly of so doing.

As a proof of the estimation in which safes are held, I don't know of a merchant or builder who is not arranging for fire-proof vaults in the new stores, and I know of hundreds who are so arranging.

Yours, at command,

WHOLESALE MERCHANT.

## MINING SUMMARY.

### Nevada.

GOLD MOUNTAIN AND LIDA VALLEY.

From the Reese River *Reveille* of March 14.

Gold Mountain District was formed in 1868 by MESSRS. SHAW & AYERS, who own a number of locations. It is situated 43 miles southeast from Silver Peak and comprises an area of 12 miles in length by 6 miles in width. The first locations were made in Tule Canyon, at the western end of the district, and at the present time number about 150, the principal of which, thus far, are the Borneo, Novazembla, Silver Cross, Peacock, Ruth, Texas, Vermillion, Red Jacket, Cape Horn, and Blue Wing. The formation of the country consists of granite, slate, and porphyry, the veins, which run east and west, being incased in porphyry. They vary in size from 8 inches to 10 feet, yielding ore which assays, per ton, $100 in gold and as high as $2,289 in silver, the Silver Cross having produced the ore which yielded the latter figure.

Last summer MESSRS. SHAW & AYRES built a small arastra in which they worked gold ore from the Novazembla mine. The arastra was a trifling affair, capable of reducing only 140 pounds of ore per day, which yielded at the rate of $300 per ton. At the present time the principal portion of the work done in the district is performed by four companies. Mr. HIGGS has been engaged in running a tunnel for water and has already tapped a small quantity, but not sufficient to supply a mill. The want of water for milling purposes is one of the drawbacks of the camp; there is an abundance for domestic uses, but unless Mr. H. succeeds in increasing the volume of water in his tunnel it will be neccessary to go three or four miles for a mill-site. There is a fair supply of small timber in the vicinity of the camp, and an abundance of it at a distance of four miles.

Lida Valley was first discovered by Col. D. E. BUEL in 1864, during his famous trip to Death Valley in search of the "lost wagons."

The first mining locations were made last June by Messrs. BLACK & SCOTT, who took out some ore which they hauled to a small mill in Columbus, which paid between $400 and $600 per ton. Shortly after this they sold one of their mines to a San Francisco company for $3,800. This company subsequently bought another mine from Mr. Brown which was called "Brown's Hope," for $5,000, and erected or bought a small prospecting mill at Deep Springs, 35 miles west from Lida. Their returns must have been satisfactory, for they are now making preparations for the erection of a first class silver mill, with improved furnaces attached to it. The ore of this district is different from that of Red Mountain, being nearly all silver ore, carrying little if any gold.

A large number of people have already settled in the district who are busily at work prospecting the surrounding hills and opening locations already made, and from results already obtained it is safe to predict that that section of the State, heretofore considered only fit for Indians and wolves, will soon rival the older and better known mining districts of this portion of Nevada.

### Dacotah.

THE DACOTAH GOLD FIELDS.

From the *Rocky Mountain News* of April 3.

A special from the west to the New York *Herald*, states authoritatively that Gen. HANCOCK, commanding the department of the Missouri, has been instructed to interpose the arm of the military to prevent the departure of the prospecting expedition to the country about the Black hills. These hills, and a large territory of unexplored country around them, belong to the Sioux Indian reservation, and hence the restrictions imposed by the government in relation to intrusions upon the red man's grounds. An agent was dispatched to Washington to prevail upon the government to send out a sufficient military force to retard the steadily increasing influx of prospectors and adventurers in that direction.

Undoubtedly great excitement has prevailed in Iowa, Northern Nebraska, and throughout Dacotah, and the papers in those localities have teemed with golden marvels. The marvellous tales which have gained currency are wholly circumstancial, and are the creations of interested parties, ranchmen, traders, and speculators, who invented the trick and understand it to perfection. Those fellows have learned that there is nothing equal to a first-class mining excitement to deplete plethoric stocks of goods and put money in their purses. Dacotah has been, from the date of her organization as a territory, in a really bad way; the times are tight up there, and need a headlong rush to mend them. We remember how frantically she carried on in 1867, when a few nuggets,—stolen, in all probability, from Colorado or Montana,—were brought to Yankton, and there used to quicken the public pulse. We recollect that one of the Smiths, who was suspected of Munchausenish qualities, undertook the formation of a company, to explore the new Ophir, and actually succeeded in decoying to Yankton, the capital of Dacotah, and the rendezvous of the company, some fifty or a hundred blockheads. At any rate, there were enough of them to throng the hotels, overrun the saloons, and lend an air of thrift to the Dacotian capital; but they were a handful of men, though each had been as brave as a Cardington, to whip a path through the nomadic ranks, and march triumphant to the hills. The government, through its military, then as now, interposed its protection on the side of the Indian, and the suppression of Smith's project was complete.

Ever since that time, at stated periods, the country has suffered from a recurrence of the fever, occasioned by the thoughtless exhibition of a nugget. Latterly the eastern, or, rather, northwestern press, for a radius of a few hundred miles around Sioux City, has teemed with marvellous, yet suspiciously circumstantial, stories of the metallic treasures, in those unexplored mountains. One account reports a hunter as saying that one hundred Sioux Indians, are working on Pryor creek, a small stream that empties into the Yellowstone, and that these Indians, provided with no other utensils than a pan, pick and shovel, are taking out each one hundred dollars per day! That is our idea of the sublimity of lying. One of the mortal few who were not born to tell the truth. Even Father De Smet, the good Jesuit missionary, is remembered to have said, a long time ago, that gold by the bushel could be picked up among the Black hills. It's astonishing how many men, living and dead, have, from time to time, borne testimony to the accuracy of these tales, and to the metalliferous wonders of that region. The latest story, put forth by a Dacotah paper, is, that a fellow named THOMPSON, with seventeen others, during a *recent* trip through the Black hills country, saw in the hands of Indians nuggets of gold as long as your hand and as thick as your thumb. Evidently THOMPSON'S conscience is not clogged by anything resembling veracity. We are so skeptical as to disbelieve that any such party were recently in the Black hills at all.

These Black hills, which are often mistaken for the range of that name opposite Cheyenne, lie several hundred miles north of the Union Pacific, between the 43rd and 45th degrees of latitude and the 103rd and 105th meridians of longitude, and are said to occupy an area of 6,000 square miles. No one is in possession of positive proof that the rocks and rivers contain metallic deposits of unusual value, and the inconvenience of supplying such proof will, in course of time, work serious injury to the present high standard of reputation accorded to that region. In the various reports of official explorers, who, whilst prosecuting their examinations, kept one purpose constantly in view, viz: the availability of the resources, we find frequent unqualified references to such natural advantages as entice the farmer, the stock-raiser, and the thrifty husbandman, but nothing that can be construed to comport with THOMPSON'S tale of five-inch nuggets. One thing is certain: official explorers, of whose visit to that country there can be no doubt, and who endured much hardship to inform themselves of its capabilities, have furnished us no startling stories of gold, nor of any of the metals; while the fabricators of the present excitement, whose knowledge of the locality is partially, if not entirely, chimerical, and whose motives are seriously suspected, would have us believe that the precious metals abound there in unlimited quantities. General WARREN'S official report is the most favorable yet made upon the mineral resources of that section. He says:

"The next question that arises, pertains to the mineral resources of the Black hills. I will not speak of their geological structure in detail at this time, but reserve that for a future letter. The gold and most of the valuable minerals along the eastern slope of the Rocky Mountains are found in a metamorphic, or as they are sometimes called, the azoic (destitute of organic life) rock, that is crystalline, limestone, slates, quartz beds, etc. These rocks occur around the Black hills with a thickness of one thousand to two thousand feet. To what extent the precious metals will be found in these rocks I will not attempt to foretell. My facilities of examination were very poor, and only a superficial one could be made, but enough was determined to show that gold and silver occurs in greater or less quantities, and that all the other minerals occur in abundance. Gypsum is found in beds from ten to fifty feet in thickness—beautiful, snowy gypsum."

Now, in conclusion, we would advise the reader, whether of this or any other paper, to note all sensational stories carefully, and, if he is sensible, he will look before he leaps. It behooves the poor man, whose poverty is a perpetual incentive to grapple with games of chance, to beware of those mercurial fellows, who, like THOMPSON, have elevated lying to the dignity of a fine art. This is the old, old trick; the farther off, the richer the mines. Fair, good mines, like honest prophets, have no honor at home.

The Chicago *Evening Journal* has this to say upon the subject matter of the reported discoveries:

"We have received from a citizen of Dacotah Territory, who is well-informed as regards matters and things in the Western Territories, a letter, in which he warns us against this new humbug, which is gotten up by sharpers to victimize such poor dupes as they may induce to join their wild goose 'expedition.' He says there is probably no gold in the Black hills, and even if there was, the Federal government's treaty with the Indians of that region, is of such a character, that no workmen can legally take possession of the hills in question they being reserved territory. We give this statement as a caution to the public."

The Idaho *Statesman* of March 26 says on the same subject:

A private letter received at Sioux City, Iowa, from Fort Randall, states that a few days since a party of Indians arrived there direct from the Black hills region.

They had in their possession nuggets of gold and considerable quartz, which they refused to sell to the officers. Considerable excitement exists there among citizens and soldiers over the gold discoveries in the Black hills.

This is the "old thing." The story of the Indians bringing in large specimens of gold from some unknown country has been told over and over again. They have been followed and followed, and not one in ten thousand has ever proved true. The idea that the Indians wouldn't sell this gold is another part of this nonsensical secret. Everybody that knows a Sioux Indian knows that they would have bartered their last specimen and the last rag on their backs for a few bottles of whiskey. Sensible miners are not caught now-a-days with this old Indian story. We didn't like the looks of the reported gold discoveries in the Black hills when first gotten up, but did not know but there might be some foundation for them. We are now more than ever convinced that the whole story is a canard; that nobody knows anything about it.

## California.

### JULIAN AND BANNER DISTRICTS.

From the San Diego *News* of March 16.

At Julian general activity prevails. All of the mills are running, and nearly every ledge is being worked upon, some quite extensively. The merchants are doing a good business and money seems to be plenty.

At Banner, the mill of WHITNEY & Co. has temporarily stopped. It is expected that work will be commenced on a more extended scale in a short time. Mr. WHITNEY is expected to arrive from San Francisco shortly, and on his arrival active operations will be resumed.

The Stonewall Company are still pushing work with vigor. Since water was struck in the shaft the mill has been running steadily night and day. A recent clean up of float and other rock made a good showing. The next crushing will be made on rock from the true ledge. When completed we will give the figures.

The De Frees mill cleaned up two or three days since a lot of ore from the Mabel ledge. Forty-eight tons were crushed, which yielded $48 per ton.

The Reynolds mill has just finished crushing 20 tons of ore from the Big Blue lead, which gave $53 per ton.

The proprietors of the Owens lead are now running a level at the depth of 200 feet. The ore in sight is about the same grade as that recently crushed at the mills of DE FREES & Co. and REYNOLDS', and will go about $19 per ton. There is sufficient ore to keep a hundred stamps busy, if the mine is properly worked.

The Helvetia mine is being worked steadily at present, Its owners are now engaged in taking out a lot of ore which will be crushed at the mill of DE FREES & Co.

The Excelsior lead, partly owned by the Count, has a day and night force at work. There is plenty of good rock in this lead, and the general impression is that a crushing will show very favorable results for its owners.

The Antelope mill is busy at work upon Madden rock, and has several engagements to crush for other companies. From present prospects they will have but little time to devote to the crushing of rock from their own lead.

WILSON & Co. are crushing ore from the Helvetia rock. The working of the new mill gives general satisfaction, and it will no doubt always have as much work as it can attend to if its proprietors wish to devote themselves to custom work. The boring of the artesian well is going on steadily, and water was expected at any minute by the borers.

Work has been resumed on the Washington lead, which has recently been leased. It will be remembered that the Washington was the first ledge discovered in the Julian District. For a short time after its discovery it was worked vigorously, but after a while operations ceased upon it. It has always been regarded as a good ledge, and will no doubt, when developed, prove a good paying mine.

Every one at the mines feels sanguine about the future prospects of that portion of the county. An interest in the improvement of the town of Julian is being manifested, and the subject of good roads is one that occupies the attention of nearly every one. It is expected that several private roads will be built from the mines to the mills this Spring, which will require the expenditure of considerable cash. As those interested are ready to expend it, it is fair to suppose that they feel confident about getting their money back.

All hands are watching the experiment of WILSON & Co. in boring for artesian water. If, as is confidently expected, it proves a success, several will be sunk at once.

### WALLAPAI DISTRICT.

From the Los Angeles *News* of March 20.]

The Surbat mountains are about four miles in width at the point where Mineral Park is located, which is about 3,000 feet above the level of the sea, and are bounded on the west by the Sacramento Valley and the Colorado river, and on the east by the Hualapai Valley and mountains. The Park is thirty-five miles from Hardyville, and twenty miles from the nearest point on the Colorado river. The ledges are found in a granite formation, their casings being of talcose slate, their line of strike being in a south-easterly and north-westerly direction, and inclining to the north-east at an angle of about 75 degrees. The ledges give every evidence of being true fissure veins and are traceable in many instances from 5,000 to 10,000 feet, showing a width of vein of from two to eight feet and in some instances larger. The ledges on the surface in many places show argentiferous galena. Quite a number of mines are being worked with success. The five-stamp mill owned by Messrs. HARDY & Co. is at present running on ore from the Lone Star mine which yields upward of $300 to the ton. The Keystone, Fairfield, Clinton, Cassian, Indus, Telegraph, Donohoe, Diana, Empire, Naiad Queen, Lily of the West, Ida Elmore, Vanderbilt, Valley View, Champion and many others, are yielding fine ore, much of which will pay to ship. At present the camp has rather a lively appearance. Mr. COVER has arrived, and smelting works are expected to be in operation in a very few weeks. The "Revenue Silver Mining Co." of San Francisco have commenced work on some of their mines in this district, and they are turning out first class ore, some of which will be shipped to San Francisco, in order to give unbelievers a chance to see and test for themselves.

This will undoubtedly be one of the leading mining camps on the Pacific coast when thoroughly tested. There are mines located and being worked over a scope of country some 14 miles in length by about 3 to 4 in width, and not a single mine that has been sunk to a depth of five feet, that I have seen, that will not assay $50 and upward to the ton, and as high as $5,000. Some few days ago I saw fine ruby and antimonial silver taken from the Keystone mine at the depth of 50 feet, which I was told assayed at the rate of $4,800 to the ton. To get assays as high as sixteen hundred and two thousand dollars is quite common. The principal town is at this place, being head-quarters.

You need not be afraid of these mines for there will be mining here in Hualapai District when nine-tenths of the mining camps are dead and buried.

### WILLOW VALLEY.

From the Nevada *Transcript*.

The Lecompton ledge was discovered many years ago, and has been worked by several parties, the quartz always presenting a favorable appearance. The last crushing from this ledge, taken out many months ago, paid $60 per ton, and some previous crushings have yielded as high as $120 per ton, which was crushed at the Oriental mill. The mine is now idle for want of sufficient capital to erect machinery. We understand negotiations are being made for the erection of machinery, and as soon as this is done we may expect to hear of great results.

The ledge owned by BROWN & GAGAN is about one and a half feet thick, and is rich in sulphurets. This mine was opened during the present season, the first crushing paying $18 per ton, and as the work has progressed the rock increases in richness.

### THE BUCHANAN.

The last lot of rock crushed at the Oriental mill, yielded $40 per ton. The Company have out a large quantity of rock, which shows free gold and is very rich in sulphurets. Arrangements are being made for machinery and when this is done the mine will rank with the best in this township.

SAM. HECKER & Co., have a splendid ledge, which is a foot and a half thick. The crushings they have had from it yielded as high as $25 per ton, and none less than $18. A cave occured in their claims a short time since, but the tunnel will be cleared in a few days, when active operations will be resumed.

### BUCKEYE CO.

This Company has a splendid three-foot ledge, and are pushing ahead with all the energy they possess. They are taking out large quantities of rock, and it is paying them from $22 to $25 per ton.

### MURCHIE & CO.

The old quartz ledge of MURCHIE & Co., excels any in richness in this township. The ledge is large, and is paying about $60 per ton. They have hoisting works, and an 8-stamp mill which is kept in operation day and night. They are cleaning up many thousands of dollars each week.

MURCHIE & Co., have been engaged for a long time in running a tunnel to enable them to work a gravel range which they own, and while doing so they ran against the best quartz ledge ever discovered in that section of country. The ledge is over a foot thick, and will pay not less than $80 per ton. They picked out of the gravel claim some of the quartz, which was crushed and paid over $200 per ton. The MURCHIE's have got the richest mines in this part of the State, and every one interested in these diggings is sure of a splendid fortune. We are glad they have met with such good luck, for they are all industrious, honest and hard-working men, and deserve the success they have met with for their indomitable perseverance.

There are a large number of companies engaged in prospecting: and every few days new discoveries are being made which will doubtless prove as valuable as any of the ledges above mentioned. Comparatively but little work has been done at Willow Valley until this season, and it is now demonstrated that the ledges, with proper work and machinery, will prove equal to any quartz claims in the State.

## Utah.

From the Salt Lake *Tribune* of March 22nd.

### TINTIC DISTRICT.

C. T. Meader is shipping ore in large quantities from the Sunbeam, Swansea, Lucky and other lodes. A number of smelters are to start up this spring. A Mr. Foley has bought the Joe Bowers and is running 3 shifts of 18 men. The S. L. M. Co. has resumed work. Holcomb has let a contract to sink 2 shafts on his Sunbeam claim. L. J. Whitney is about commencing work on his claim on the Sunbeam; and More's claim on the ledge is yielding marketable ore.

### OPHIR DISTRICT.

Over one half of the Virgin mine was sold a few days ago for $12,000. The Lizzie, close by, is a well defined lead down about 50 feet with a good quantity of ore in the mine and on the dump.

On Chloride Hill the ore averages $300 to $400. The Chloride Queen is being industriously worked. The San Joaquin just below, and the Chloride Gem just above, are both lying idle. The Gem has a 35 foot shaft, also a cut and tunnel, all showing the best of chloride ore. The Jupiter has been worked some of late, but only to keep jumpers off. The Gray, a promising looking lead, is soon to be proven up. The Dardon and Annie mines are being worked with paying results. The Struck It has been run in 50 feet, and a shaft is being sunk in the tunnel.

### CAMP FLOYD DISTRICT.

The 20-stamp mill of the Camp Floyd Co. will be running by the first of May. The Sparrow Hawk Co. have commenced 3 shafts which they are sinking fast, as well as blasting out in open cuts and tunnels. About 1,500 tons of ore are on the dumps. The Silver Circle is reported sold for $30,000. The America shaft is 50 feet deep, 29 of which goes through the rock that assays well.

A fine seam of coal, 6 feet in thickness, has been opened on Chalk Creek.

## Montana.

### THE FIRST PRODUCT OF THE SILVER REDUCTION WORKS.

From the Herald of March 23.

At 10 o'clock this morning the largest silver button ever cast in this Territory was turned out at the Helena Reduction Works—the first test and the first product in a practical shape—since operations were commenced. The process of cupellation was witnessed by quite a number of our citizens who visited the works this morning for that express purpose. They were not in the least disappointed as to the result, but somewhat surprised, for in a briefer time than we are writing this article the huge button above referred to was brought from the cupel furnace as bright as a new dollar, and a handsomer button we never saw before. Its weight is 308 pounds, or 4928 ounces, and its value is upwards of six thousand dollars. Mr. Rothschild and Captain Child brought the precious lump to the bank of S. H. Bohm & Co., where hundreds of our citizens as well as strangers visiting the city, went to see the largest silver brick ever cast in the Rocky Mountains. On account of the crowd which gathered in and around the bank, rendering ingress as well as egress almost impossible, it was decided to remove this ponderous piece of silver bullion to the assay office of Chas. Rumley, to remain on exhibition till to-morrow. It will then be cast

into bricks or bars of the usual size and shipped East. Mr. Rumley, Superintendent of the Works, says he intends to run out a button similar to this, every ten days from this time henceforth, unless some unforseen obstruction should prevent. And now, we feel like congratulating Messrs. Bohm & Co., the lessees of the Reduction Works, as well as the stockholders thereof, upon an event so auspicious, and the profitable investment which they have made, and the great enterprise which has been so successfully carried out. Other works of a similar character will be, in all probability, built, either in Helena or in this vicinity, and a new era of prosperity may be said to have already dawned upon this people.


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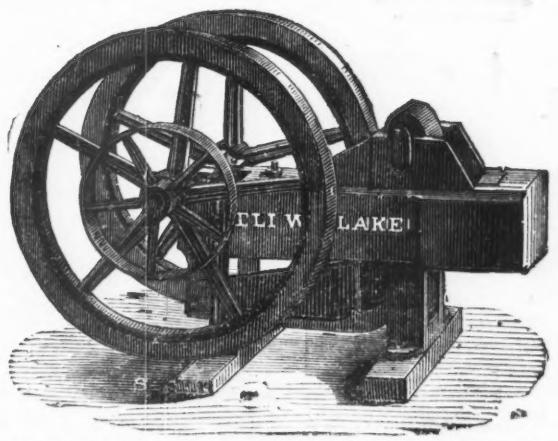

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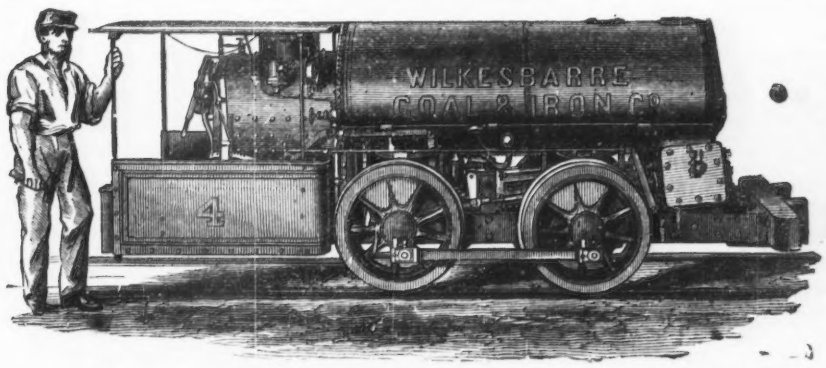


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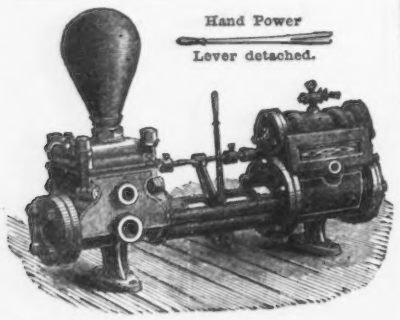


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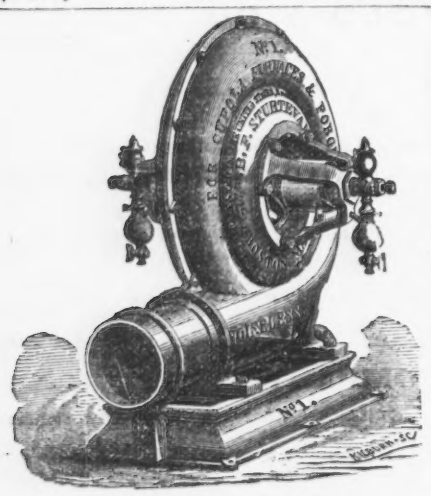

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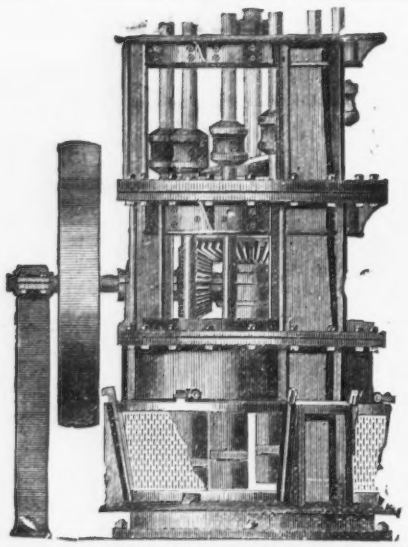

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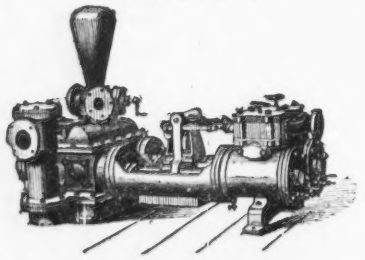

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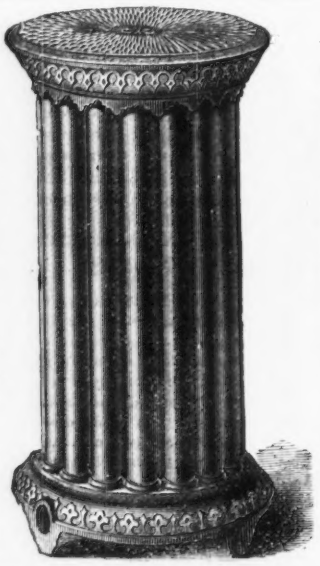

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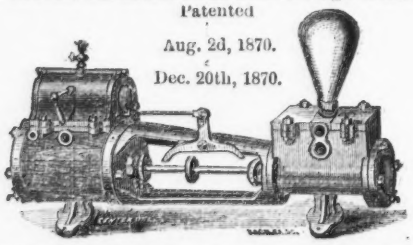

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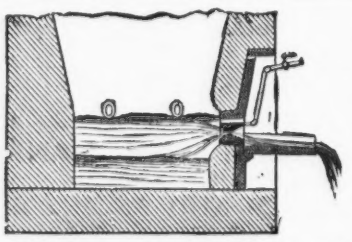

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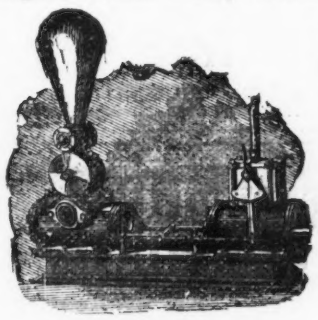


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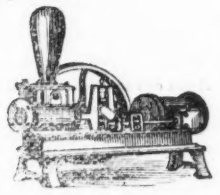

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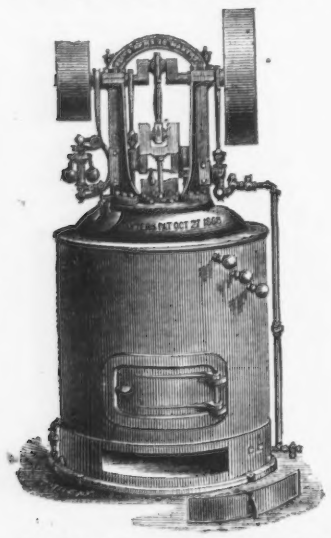

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